inform **September 2009** Volume 20 (9) 553–616

www.aocs.org

inform

AOCS

International News on Fats, Oils, and Related Materials

Biofuels update

Biodiesel and health

ExxonMobil invests in algae

Second-generation feedstocks

desmet ballestra
Science behind Technology

Food & Feed

Oils & Fats
Animal Feed

Chemicals for Life

Oleochemicals
Detergents, Surfactants & Chemicals
Soap

Biofuels

Biodiesel
Bioethanol
Biomass

www.desmetballestra.com

Experts in | **MISSION CRITICAL** | Soap and Detergents Flow Solutions

"Any time I need to install pumps or troubleshoot flow issues, I take no chances. I call in the experts – Blackmer."

Mike Doll
Plant Manager
Peter Cremer North America, LP

Blackmer pump technologies are designed to deliver the best flow solutions for improved:

- Operational efficiencies
- Product loss prevention
- Environmental protection
- Through-put and uptime
- Energy savings
- Reliability

A Smart Energy™ Solution by Blackmer

Blackmer Sliding Vane Pumps are Energy-Efficient by Design

Better Get Blackmer

(616) 241-1611
www.blackmer.com

BLACKMER MEMBER OF PSG™ PUMP SOLUTIONS GROUP A DOVER COMPANY

Blackmer® A DOVER™ COMPANY

1809 Century Avenue SW, Grand Rapids, MI 49503-1530

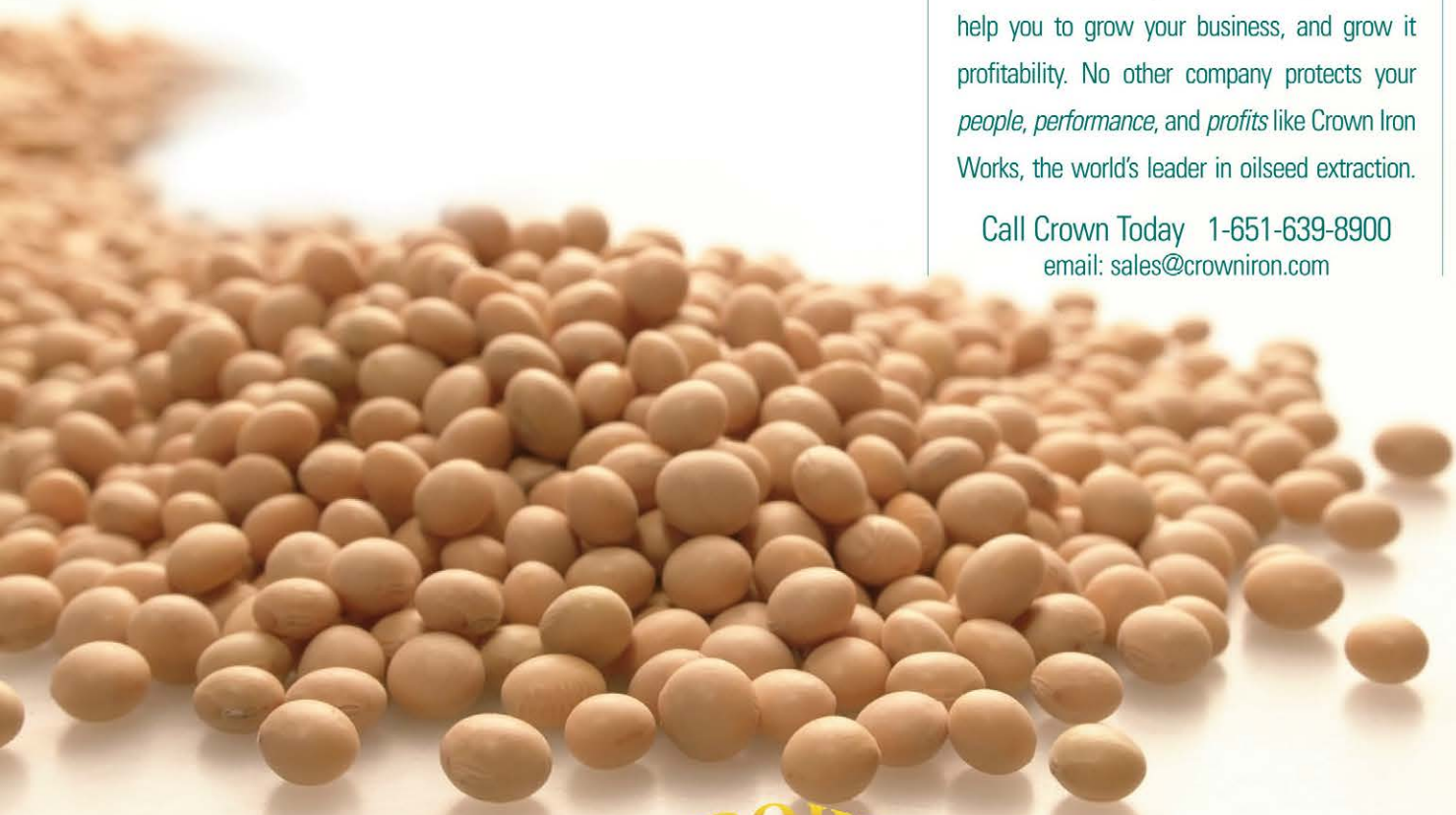
Process | Energy | Transport | Military & Marine

SLIDING VANE PUMPS | PERISTALTIC (HOSE) PUMPS | RECIPROCATING GAS COMPRESSORS

At Crown Iron Works, We See A Whole Lot More Than The Bean.

Crown Iron Works understands the oil processing industry well enough to know what revenue streams are important to you. Using this knowledge, we have worked endlessly to develop advanced processing technologies to improve your bottom line. Crown Iron Works' technologies are designed to give you the maximum return on your investment, so we can help you to grow your business, and grow it profitability. No other company protects your *people*, *performance*, and *profits* like Crown Iron Works, the world's leader in oilseed extraction.

Call Crown Today 1-651-639-8900
email: sales@crowniron.com



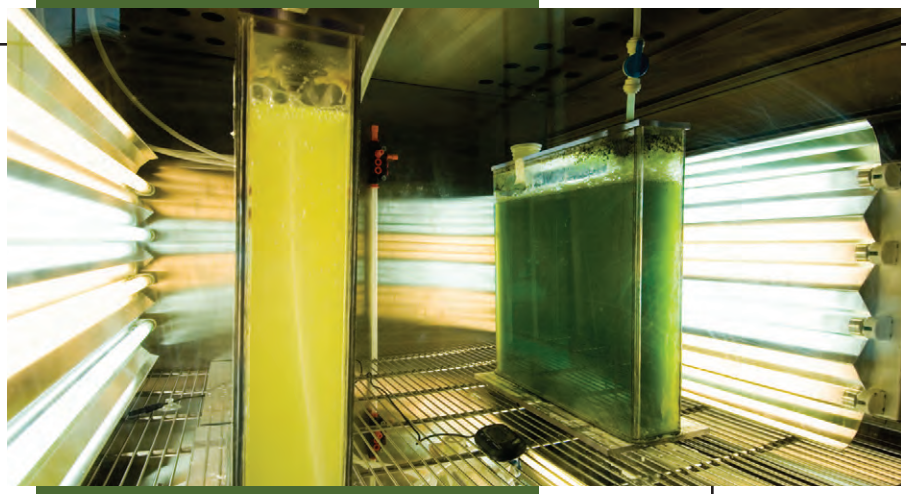
CROWN®
EST. 1878

Processing Possibilities.

The World Leader In Oilseed Processing Equipment

PREPARATION DEHULLING | EXTRACTION | OIL PROCESSING | BIODIESEL | SOYA PROTEINS | CO2 EXTRACTION | PILOT PLANT

CROWN IRON WORKS COMPANY 2500 West County Road C Roseville, MN 55113 USA
call us today *1-651-639-8900* or visit us at *www.crowniron.com*
Additional offices in Argentina, Brazil, China, England, Honduras, India, Mexico, Russia and the Ukraine.



On the cover: Alpha cribs containing colonies of algae grow at the Colorado State University (CSU) Engines and Energy Conversion Laboratory. CSU researchers are working with Solix Biofuels to create a line of algae and a system to economically produce biodiesel from algae. Image courtesy Colorado State University.

www.aocs.org

inform

AOCS

September 2009 Volume 20 (9) 553–616

Departments and Information

556 Index to Advertisers
556 Calendar
568 Classified Advertising

Marketplace:
569 News & Noteworthy
575 Biofuels News
583 Health & Nutrition News
587 Biotechnology News
590 S&D News
594 People News/ Inside AOCS

Publications:
599 Patents
600 Book Review
601 Extracts & Distillates

605 Student Page

AOCS Mission Statement
To be a global forum to promote the exchange of ideas, information, and experience, to enhance personal excellence, and to provide high standards of quality among those with a professional interest in the science and technology of fats, oils, surfactants, and related materials.

inform • International News on Fats, Oils, and Related Materials
ISSN: 0897-8026 IFRMEC 20 (9) 553–616

560 **Health hazards from biodiesel blends?**
Jürgen Bünger, Jürgen Krahl, and Axel Munack adapt their presentation from the 100th AOCS Annual Meeting & Expo investigating the possible effects of biodiesel on health.

563 **Melamine analysis at the forefront**
Recent food safety scares involving melamine have put the development of new standards and methods for protein detection on the fast track. Catherine Watkins reports.

567 **Recasting the pathway—Teaching plant lipid biochemistry by analogy**
Crystal L. Snyder and Olga P. Yurchenko explore new teaching strategies for the fats and oils field.

573 **Ghent University in Belgium invests in new cocoa laboratory**
Willem van Nieuwenhuyzen offers background and technical details on the UGent Cacaolab.

577 **ExxonMobil to spend $600 million on algae-based fuel R&D**
In a departure from its previous position shunning biofuels, ExxonMobil elects to join Synthetic Genomics Inc. in a five-year R&D agreement. Marguerite Torrey reviews these developments.

579 **To make biofuels, or not to make biofuels: That is the question**
Marguerite Torrey examines recent work done in the search for second- and third-generation feedstocks.

595 **Phoenix rising**
Catherine Watkins continues her preview of the 2010 AOCS Annual Meeting & Expo, with coverage of its host city, Phoenix, Arizona.

597 **Technical Program highlights for AOCS' 2nd International Congress on Biodiesel**

608 **The Cooperativa Obrera: An example in promoting good nutrition**
Eduardo Dubinsky presents a case study in healthful foods promotion.

611 **Genomics and biotechnology are revolutionizing soybean productivity and product quality**
Richard F. Wilson provides a report on the Hot Topic, presented at the 100th AOCS Annual Meeting & Expo, held in Orlando, Florida.

613 **2009–2010 AOCS Approved Chemists**

Calendar

Bold type: *new listing*
For details on these and other upcoming meetings, visit www.aocs.org/meetings.

October

October 3–4, 2009. Crystallization of Lipids, from Nucleation to Application, Le Méridien King Edward Hotel, Toronto, Ontario, Canada. Information: www.aocs.org/meetings/crystallization.

October 4–6, 2009. 23rd Meeting of the Canadian Section of AOCS: Fats and Oils Functionality in Processed Foods: from the Fundamental to the Applied, Le Méridien King Edward Hotel, Toronto, Ontario, Canada. Toronto, Ontario, Canada. Information: www.aocs.org/meetings.

October 5–6, 2009. 6th Global Oils and Fats Business Forum USA: Future of Oils and Fats: Assessing Sustainability, Technology and Bioenergy, J.W. Marriott Hotel, New Orleans, Louisiana, USA. Information: www.americanpalmoil.com/6thgoff.html.

October 5–7, 2009. Food Processing Suppliers Association Process Expo, Las Vegas Convention Center, South Hall, Las Vegas, Nevada, USA. Information: www.iafis.org/processexpo/processexpo.

October 7–9, 2009. Congress of the International Federation of Societies of Cosmetic Chemists, Melbourne, Australia. Information: www.ifscc2009.com.au.

October 7–9, 2009. 3rd Annual Algae Biomass Summit, Marriot San Diego Hotel & Marina, San Diego, California, USA. Information: www.algalbiomass.org.

October 7–9, 2009. Biofuels Jatropha Markets Americas, Mexico City, Mexico. Information: www2.greenpowerconferences.co.uk/v8-12/Registration/Index.php?sEventCode=BN0907MX.

October 11–14, 2009. Bioenergy Engineering 2009, Hyatt Regency Hotel, Bellevue, Washington, USA. Information: e-mail: landeck@asabe.org; www.asabe.org, www.bioenergyengineering2009.com/.

October 14–15, 2009. American Fats & Oils Association Annual Meeting. Information: www.afoaonline.org/events.html.

October 14–15, 2009. 4th Practical Short Course: Snack Food Processing and Product Formulation, "Het Pand" Ghent University, Ghent, Belgium. Information: www.bioactivesworld.com.

October 14–15, 2009. 2nd Jatropha World Africa, Brussels, Belgium. Information: www.cmtevents.com/aboutevent.aspx?ev=091021&.

October 17–18, 2009. 5th Practical Short Course on Functional Oils: Omega-3 Fatty Acids: Market Trends, Nutrition & Health, Utilization in Food Systems, Weitzer Hotel, Graz, Austria. Information: www.smartshortcourses.com; www.bioactivesworld.com.

October 18–21, 2009. 7th Euro Fed Lipid Congress: Lipids, Fats and Oils: From Knowledge to Application, Graz Convention Center, Graz, Austria. Information: e-mail: info@eurofedlipid.org; www.eurofedlipid.org/meetings/graz/.

Index to advertisers

13th Latin American Congress on Fats and Oils	609	*Crown Iron Works Company	554
Agribusiness & Water Technology	593	Desmet Ballestra Group NV	C2
Anderson International Corp.	C3	Gianazza Engineering srl	558
Armstrong Engineering Assoc.	578	NP Analytical Laboratories	565
Blackmer/A Dover Company	553	*Oil-Dri Corporation of America	562
C.M. Bernardini	581	SafTest Division of MPBiomedical	C4
		Springer Science+Business Media B.V.	559

*Corporate member of AOCS who supports the Society through corporate membership dues.

CORRECTION

The article entitled "Oilseeds of the Future: Part 3," which was published in July 2009, incorrectly identified the headquarters of Arcadia Biosciences as being in Davis, Illinois. The company actually has headquarters in Davis, California. We regret the error.

AOCS Meeting Watch

September 21, 2009. Short Course on Refining, Handling, and Applications of Palm Oil, Hilton Cartagena, Cartagena, Colombia. Information: www.aocs.org/Palma.

September 26–27, 2009. 9th AOCS Practical Edible Oil Refining Short Course, Process Optimization, Equipment and Technology Selection, and On-Line Process Control, Sydney, Australia. Information: www.aocs.org/meetings.

September 26–27, 2009. Lipid Oxidation and Antioxidants Short Course, Sydney, Australia. Information: www.aocs.org/meetings.

October 3–4, 2009. Crystallization of Lipids, from Nucleation to Application, Le Méridien King Edward Hotel, Toronto, Ontario, Canada. Information: www.aocs.org/meetings/crystallization.

October 4–6, 2009. 23rd Meeting of the Canadian Section of AOCS: Fats and Oils Functionality in Processed Foods: from the Fundamental to the Applied, Le Méridien King Edward Hotel, Toronto, Ontario, Canada. Toronto, Ontario, Canada. Information: www.aocs.org/meetings.

November 14–15, 2009. 3rd Practical Short Course: Industrial Uses of Vegetable Oils: Biodiesel, Ink, Biobased Solvents, and Lubricants, Munich, Germany. Information: www.smartshortcourses.com or www.aocs.org/meetings/biodiesel09/index.cfm/2nd-International-Congress-on-Biodiesel-3rd-Practical-Short-Course.

November 15–17, 2009. 2nd International Congress on Biodiesel: The Science and the Technologies, The Westin Grand München Arabellapark Hotel, Munich, Germany. Information: www.aocs.org/meetings/biodiesel09.

May 16–19, 2010. 101st AOCS Annual Meeting and Expo, Phoenix Convention Center, Phoenix, Arizona, USA. Information: http://Annual_Mtg.aocs.org; phone: +1-217-359-2344; fax: +1-217-351-8091; e-mail: meetings@aocs.org.

For in-depth details on these and other upcoming meetings, visit www.aocs.org/meetings.

October 18–22, 2009. Federation of Analytical Chemistry and Spectroscopy Societies Annual Conference, Marriott Hotel Downtown, Louisville, Kentucky, USA. Information: www.FACSS.org.

October 19–23, 2009. 76th National Renderers Association Annual Convention, Ritz-Carlton Hotel, San Francisco, California, USA. Information: http://convention.nationalrenderers.org.

October 19–24, 2009. Practical Short Course on Processing and Products of Vegetable Oils, Food Protein R&D Center, Texas A&M University, College Station, Texas, USA. Information: mslam@tamu.edu; http://foodprotein.tamu.edu/fatsoils/scvegoil.php.

October 21–22, 2009. 1st Styrian Conference on Lipid Mass Spec, Hotel Weitzer, Graz, Austria. Information: www.medunigraz.at/zmf/conference09/.

October 21–22, 2009. OFI [Oils & Fats International] Asia, Balai Sidang Jakarta Convention Center, Jakarta, Indonesia. Information: www.oilsandfatsinternational.com/publication.asp?pubid=28&nav=3&exid=159.

October 25–28, 2009. Bioactive Lipids in Cancer, Inflammation and Related Diseases, CasaMagna Marriott Cancun Resort, Cancun, Mexico. Information: http://bioactivelipidsconf.wayne.edu.

October 26–28, 2009. 8th Annual World Food and Technology & Innovation 2009, World Trade Centre, Rotterdam, Netherlands. Information: www.foodinnovate.com/home.asp.

CONTINUED ON PAGE 558

inform

2710 South Boulder Drive
P.O. Box 17190
Urbana, IL 61803-7190 USA
Phone: +1-217-359-2344
Fax: +1-217-351-8091
E-mail: publications@aocs.org

Advertising Instructions and Deadlines:
Closing date is approximately the first of the month preceding date of issue. Insertion orders received after closing will be subject to acceptance at advertiser's risk. No cancellations accepted after closing date. Ad materials must be in final form for press upon materials' closing date. Materials received after deadline or requiring changes will be published at advertisers' risk. Send insertion orders and mechanical materials to advertising offices at the address listed above.

NOTE: AOCS reserves the right to reject advertising copy that in its opinion is unethical, misleading, unfair, or otherwise inappropriate or incompatible with the character of *inform*. Advertisers and advertising agencies assume liability for all content (including text, representation, and illustrations) of advertisements printed and also assume responsibility for any claims arising therefrom made against the publisher.

AOCS Advertising: Valorie Deichman
Phone: +1-217-693-4814; Fax: +1-217-351-8091
E-mail: valoried@aocs.org

Formerly published as *Chemists' Section, Cotton Oil Press*, 1917–1924; *Journal of the Oil and Fat Industries*, 1924–1931; *Oil & Soap*, 1932–1947; news portion of *JAOCS*, 1948–1989. The American Oil Chemists' Society assumes no responsibility for statements or opinions of contributors to its columns.

inform (ISSN: 0897-8026) is published monthly by AOCS Press, 2710 South Boulder Drive, Urbana, IL 61802-6996 USA . Phone: +1-217-359-2344. Periodicals paid at Urbana, IL, and additional mailing offices. POSTMASTER: Send address changes to *inform*, P.O. Box 17190, Urbana, IL 61803-7190 USA.

Subscriptions to *inform* for members of the American Oil Chemists' Society are included in the annual dues. An individual subscription to *inform* is $165. Outside the U.S., add $30 for surface mail, or add $115 for air mail. Institutional subscriptions to the *Journal of the American Oil Chemists' Society* and *inform* combined are now being handled by Springer Verlag. Price list information is available at www.springer.com/pricelist. Claims for copies lost in the mail must be received within 30 days (90 days outside the U.S.) of the date of issue. Notice of change of address must be received two weeks before the date of issue. For subscription inquiries, please contact Doreen Berning at AOCS, doreenb@aocs.org or phone +1-217-693-4813. AOCS membership information and applications can be obtained from: AOCS, P.O. Box 17190, Urbana, IL 61803-7190 USA or membership@ aocs.org.

October 27–29, 2009. Biofuels 2009, 4th Annual Meeting, Budapest, Hungary. Information: www.wraconferences.com/2/4/articles/57.php?

October 28–29, 2009. 9th International Conference "OIL AND FAT INDUSTRY–2009," Azimuth Hotel St. Petersburg, Russia. Information: e-mail: market@vniig.org; www.vniifats.ru.

October 29–31, 2009. BioFuel Indonesia 2009, Griya Dome Convention Center, Medan, Indonesia. Information: www.biofuelindo.com.

October 31–November 1, 2009. International Antioxidant Forum/Short Course: Methodologies, Assessments, Applications and Health, Golden Gateway Holiday Inn, San Francisco, California, USA. Information: www.isnff.org.

October 31–November 1, 2009. Omega-3 and Beyond—Fundamentals, Applications and Health, Short Course of the International Society for Nutraceuticals & Functional Foods, Golden Gateway Holiday Inn, San Francisco, California, USA. Information: www.isnff.org.

November

November 1-4, 2009. Annual Conference and Exhibition of the International Society for Nutraceuticals and Functional Foods, San Francisco, California, USA. Information: www.isnff.org.

November 1–5, 2009. ASA-CSSA-SSSA (American Society of Agronomy-Crop Science Society of America-Soil Science Society of American) 2009 International Annual Meetings, Pittsburgh, Pennsylvania, USA. Information. www.acsmeetings.org.

November 1–6, 2009. XIII Congreso Latinoamericano de Grasas y Aceites (XIII Latin American Congress on Fats & Oils), Metropolitano Events and Convention Center, Rosario, Argentina. Information: e-mail: asaga@asaga.org.ar; www.congreso.asaga.org.ar/eu/index.aspx#integrating.

November 2–4, 2009. BIO-Europe, 15th Annual International Partnering Conference, Messe Wien Exhibition & Congress Center, Vienna, Austria. Information: www.ebdgroup.com/bioeurope.

November 2–5, 2009. Soya & Oilseed Summit 2009/Global Soybean & Grain Transport 2009, The Roosevelt Hotel, New Orleans, Louisiana. Information: http://events.soyatech.com/conference.php?cid=10.

November 8–12, 2009. Practical Vegetable Oil Extraction Course, College Station, Texas, USA. Information: http://foodprotein.tamu.edu/extractionprotein/scvegoil.php.

November 9–12, 2009. Malaysian Palm Oil Board International Palm Oil Congress 2009 (PIPOC 2009), Kuala Lumpur, Malaysia. Information: e-mail: pipoc2009@mpob.gov.my; www.mpob.gov.my or www.conferencealerts.com/seeconf.mv?q=ca1xmhs3. ■

Health hazards from biodiesel blends?

Jürgen Bünger, Jürgen Krahl, and Axel Munack

The replacement of petrol-derived fuels by biogenic fuels from renewable resources has generated worldwide interest and is being investigated scientifically for its environmental costs and benefits. According to current understanding of global warming, the reduction in atmospheric greenhouse gases (GHG) is of specific interest, since the combustion of biogenic fuels reduces net GHG emissions compared with fossil fuel.

Fatty acid methyl esters (FAME) are proven as a suitable alternative to fossil diesel fuel (DF), producing similar or even lower emissions upon combustion. FAME, also called biodiesel, can be produced from different oil-bearing plants, for example, rapeseed (canola), oil palm, soybean, and sunflower, by transesterification of vegetable oils with methanol, resulting in a fuel with similar properties as mineral oil-derived fuels.

Owing to limited sources of raw materials for biodiesel production, the capacity for DF replacement by FAME is estimated at about 20% of the worldwide consumption, and governmental policies in the United States and Europe aim to reach this goal by blending common DF with biodiesel up to 20% by volume.

Carcinogenicity of diesel engine exhaust

Diesel engine exhaust (DEE) is classified as probably carcinogenic to humans. DEE contains mutagenic and carcinogenic polycyclic aromatic hydrocarbons (PAH) and nitrated PAH (nPAH) on the surface of the emitted diesel engine particles (DEP) and—to a lesser extent—in the gaseous phase.

Mutagenicity of DEE was detected in the late 1970s by extracting PAH and nPAH from DEP and assaying the extracts with the so-called Ames test. The Ames test is a powerful screening tool for detection of mutagenic potency of extracts of DEP. It allows a rapid comparison of mutagenic effects of the exhaust from different fuels using the tester strains TA98 and TA100 (of *Salmonella typhimurium*) with and without metabolic activation by rat liver enzymes (S9). The Ames test is adopted by the OECD (Organisation for Economic Co-operation and Development) as "Bacterial Reverse Mutation Assay" (Guideline 471). Mutations are the first step of the process that may lead to cancer.

The carcinogenicity of DEE was observed in consecutive studies showing that DEE probably causes lung cancer in humans after prolonged exposure to exhaust from fossil DF. In recent years every effort has been made to reduce health hazards of DEE from DF combustion, particularly emissions of DEP and carcinogens. Up to now, much less attention has been paid to possible hazards for human health from the combustion of biodiesel.

Studies on the mutagenicity of biodiesel compared with DF

The lack of information about potential hazards from biodiesel and the rapid increase in its production in the 1990s led us to the question whether the combustion of biodiesel would alter the mutagenicity of DEE compared with fossil diesel fuel and thereby influence the observed cancer risk. The mutagenic effect is a suitable screening tool to assess the carcinogenic potency of DEE.

Fifteen years ago, our working group was the first showing that combustion of biodiesel derived from rapeseed oil (rapeseed oil methyl ester, RME) produced significantly fewer mutagenic effects than exhaust from common diesel fuel. This result was confirmed by several further studies. Whereas DF produced 1,300 to 2,000 mutations per petri plate, biodiesel caused fewer than 500 mutations. Since 2000 we observed an appreciable

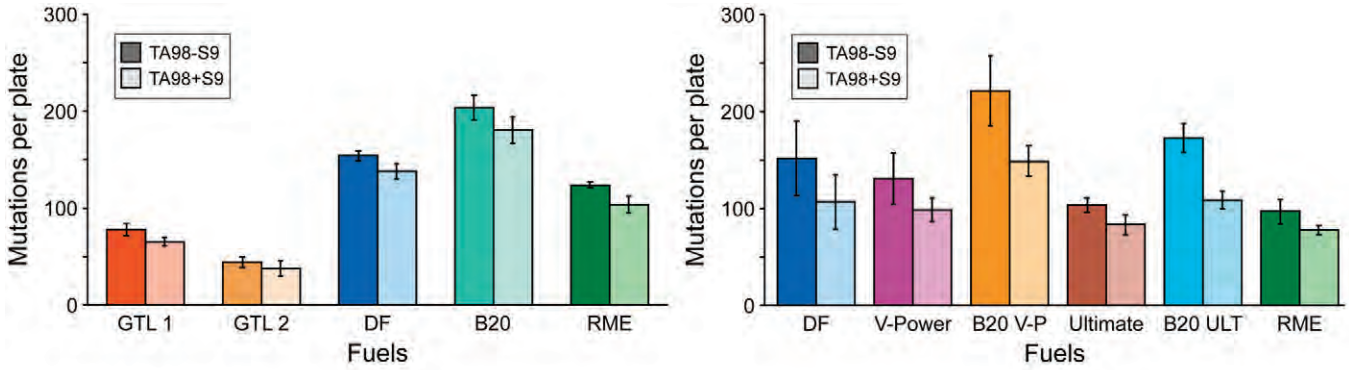


FIG. 1. *Increased mutagenicity from diesel engine particle (DEP) extracts of a mixture of 80% diesel fuel (DF; left) or Ultimate Diesel and V-Power Diesel (right) with 20% rapeseed methyl esters (RME; biodiesel) compared with neat DF and RME. Lowest mutagenic effect was observed in two gas-to-liquid (GTL) fuels. Results were obtained using tester strain TA98 with and without metabolic activation by rat liver enzymes (S9).*

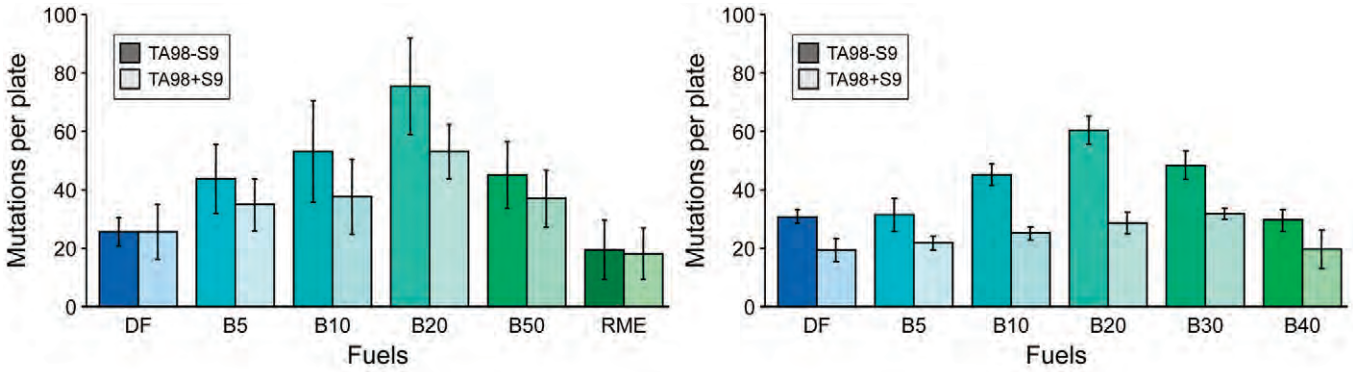


FIG. 2. *Increased mutagenicity of different mixtures of DF and RME (biodiesel) in tester strain TA98 with and without S9. For abbreviations see Figure 1.*

reduction of mutagenicity of DEE from DF driven by the reduction in content of sulfur and aromatic compounds in newly developed fuels. New engine technology and aftertreatment of exhaust further reduced the mutagenic effects of emissions independent of the combusted fuel. In our recent studies the level of mutations for DF and biodiesel was consistently below 200 mutations per plate.

Studies on the mutagenicity of biodiesel blends

Five years ago, we performed a study on newly designed gas-to-liquid diesel fuels (GTL). With these ultra-low-sulfur qualities containing no aromatics the mutagenicity of DEP extracts was reduced to even lower levels than biodiesel. In the same study we investigated for the first time a biodiesel blend consisting of 20% biodiesel and 80% common DF. Surprisingly, the mutagenic response was higher compared with both neat fuels (Fig. 1). The same result was observed in assays in which 20% biodiesel was added to Ultimate Diesel (Ult) and V-power Diesel (V-P).

This finding by chance was subsequently confirmed by additional detailed studies in a one-cylinder test engine and a modern Euro IV medium-duty truck engine (Fig. 2). With both engines we observed an increase of mutagenic effects from blend particle extracts with a maximum at 20% blends and lower values at higher biodiesel proportions.

Is there a conclusion to be drawn?

In total, the increase of mutagenicity in blends of DF and RME up to B20 was observed in three different engines. Since we had

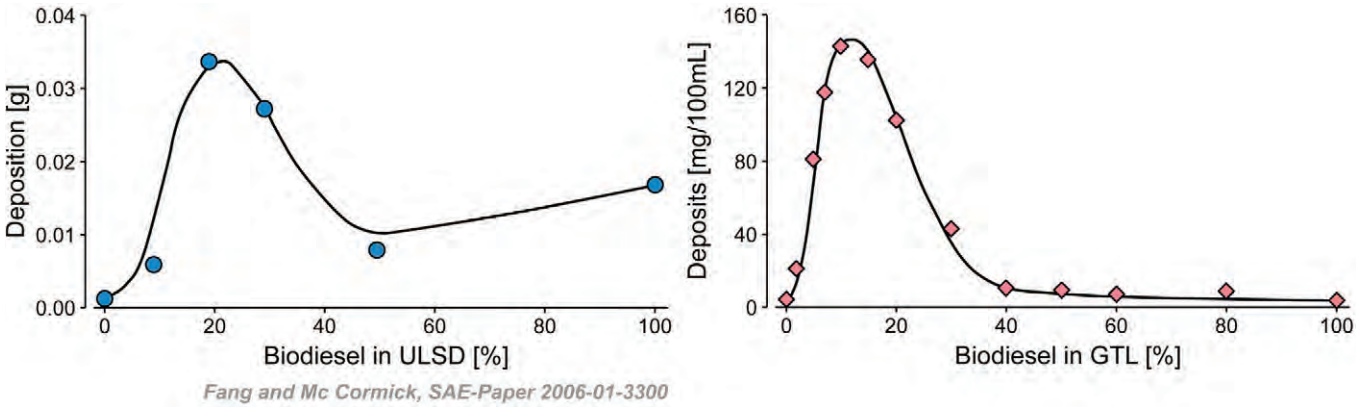


FIG. 3. *Formation of deposits after blending ultra-low-sulfur diesel (ULSD) and GTL fuel, respectively, with biodiesel.*

no sound explanation for these effects and since other researchers have not confirmed these results, we performed an extended literature search and found an unpublished Swedish report from 1994. Environmentally classified diesel fuels with a sulfur content of 2 ppm (MK1) and 5 ppm (MK2) were blended with 5% and 30% RME, respectively. The mutagenicity of the blends determined using the Ames test was higher than expected from the results of the fuels tested alone. The authors conclude: "The blends of RME and MK1 respectively react as new, different fuels, not as the sum of the components of the blend."

Although the definite reason for this surprising effect remains unclear, in our next studies we will follow this hypothesis: In the course of previous investigations on vegetable oil as diesel fuel substitute we found a significant increase of mutagenicity for these triglycerides in comparison with DF. Blending fuels in the laboratory, Fang and McCormick found a maximum of deposits at B20 that were supposed to be oligomers from biodiesel (Fig. 3, left). It can be assumed that these biodiesel oligomers may have a higher boiling point than biodiesel or may even boil under decomposition like neat vegetable oil. According to the high mutagenicity of neat vegetable oil, B20 exhaust could possibly act as a stronger mutagen because of a maximum oligomer formation leading to a maximum of pyrolysis products in the exhaust. In a first attempt to test this hypothesis we observed a very similar effect by blending GTL with RME (Fig. 3, right). Currently we are conducting engine tests and Ames assays with aged blended fuels to add further evidence to our hypothesis. ■

Melamine analysis at the forefront

Recent food safety scares involving melamine have put the development of new standards and methods for protein detection on the fast track.

Catherine Watkins

The deaths of thousands of pets in 2007 and of at least six babies in China the following year had a food adulterant in common: the industrial chemical melamine. Used properly, it is a component of countertops, dry-erase boards, fabrics, glues, housewares, fertilizers, and flame retardants. Used improperly, melamine powder—which is 66% nitrogen by weight—adds economic value by raising the apparent protein level of foods and food ingredients. To date, melamine adulteration has been confirmed in wheat gluten, infant formula, milk and milk products, eggs, vegetables, and fish and livestock feed.

It is against this backdrop that the US Pharmacopeia (USP; Rockville, Maryland, USA) convened a Food Protein Workshop for representatives from academia, government, and industry. Held June 16–17, 2009, at USP headquarters, the two-day meeting was attended by AOCS Technical Director Richard Cantrill and Project Manager Amy Johnson. The aim of the workshop was to review current analytical techniques for protein quantification and explore better ways to detect deliberately falsified protein content in food ingredients.

ANALYTICAL TOOLBOX

The test most often used to ascertain protein content for trade purposes is the Kjeldahl assay. Developed in 1883 by Johan G.C.T. Kjeldahl, the test determines the total nitrogen in a sample from both protein and nonprotein sources by measuring organic nitrogen and ammonia. The protein content is then estimated by multiplying the nitrogen content by a factor that takes into account the nitrogen content of a known or average amino acid composition. (For example, the soybean industry uses a factor of 6.25 to estimate soy protein content.)

Another classical approach that is gaining in use is the Dumas method. First described by Jean-Baptiste Dumas in 1848, the method also determines total nitrogen in a sample but takes only a few minutes per measurement as compared with the hour or more for the Kjeldahl method. One major disadvantage, however, is the high initial cost of equipment.

The US Food and Drug Administration has published six methods for melamine analysis using liquid chromatography (LC)-ultraviolet spectroscopy, gas chromatography-mass spectrometry (GC-MS) or GC-MS/MS, LC-MS/MS, and enzyme-linked immunosorbent assay using antigen-antibody reaction. Workshop participants reviewed those techniques as well as chemometrics; Fourier-transform infrared spectroscopy; and near-infrared, mid-infrared, and Raman spectroscopy for characterization of total protein.

Two new rapid techniques have been developed by researchers in Switzerland and the United States. The first, based on work

Regulatory levels set for melamine

In the wake of two recent melamine adulteration scares (see main article), maximum residue limits of 1 milligram/kilogram (mg/kg) and 2.5 mg/kg for melamine in baby formula and milk products, respectively, have been set by a number of regulatory agencies worldwide. They include the General Administration of Quality Supervision, Inspection, and Quarantine of the People's Republic of China; the US Food and Drug Administration; and the UK Food Standards Agency. Meanwhile, the European Commission has set a limit of 2.5 mg/kg in all milk-containing products and a tolerable daily intake of melamine of 0.5 mg/kg body weight.

"It is generally believed that melamine alone has limited toxicity," explains Christian Cruywagen, a professor of ruminant nutrition at Stellenbosch University in Stellenbosch, South Africa. "However, in humans and the great apes, which lack the enzyme uricase to oxidize uric acid, melamine may form strong hydrogen bonds with urate to form melamine-urate crystals or stones," he continues. "These stones, primarily composed of urate and melamine in a 2:1 ratio, were present in infants that ingested melamine-contaminated formula. On the other hand, if cyanuric acid (a related triazine) is present, a different kind of stone, melamine cyanurate, can be formed in the kidneys. The latter were implicated in the 2007 pet food recall when cats and dogs died in various countries due to renal failure," he says.

by Renato Zenobi and colleagues at ETH Zürich, uses ultrasound to nebulize liquid milk samples. The spray is then ionized by extractive electrospray ionization and analyzed by tandem mass spectrometry. The technique takes 30 seconds per sample, the researchers say, and the lower limit of detection is in the range of a few nanograms of melamine per gram of milk (*Chemical Communications 5*:559, 2009).

In other work, scientists at Purdue University, West Lafayette, Indiana, USA, used a low-temperature plasma probe to ionize liquid samples. The researchers, led by Graham Cooks, also used tandem mass spectrometry and achieved a similar speed and limit of detection (*Chemical Communications 5*:556, 2009).

A third technology devised by researchers at the BioTechnology Institute (BTI) of the University of Minnesota in Minneapolis (USA) simplifies the detection of melamine in liquids. The BTI researchers, led by Larry Wackett and Michael Sadowsky, developed melamine deaminase, which breaks one of the carbon-nitrogen bonds in melamine to release ammonia. The ammonia is then reacted to produce a blue color that is quantified by measuring the absorbance in the sample wells at 620 nm. The detection limit of the kit is 0.25 parts per million.

MICROSCOPY

At this stage, the identification of melamine with the aid of a microscope is still in a developmental phase, according to AOCS and Agricultural Microscopy Division member Christian Cruywagen. Cruywagen is a professor of ruminant nutrition at Stellenbosch University in Stellenbosch, South Africa.

"Melamine will settle with minerals in the heavy fraction of feeds," he said. "Micro-chemical spot tests are often used in agricultural microscopy to identify various minerals." Melamine is a semi-transparent white crystal without any unique characteristics. It resembles zinc sulfate in appearance and with the addition of a few drops of a 10% HCl solution, both will slowly form a white capsule, he noted.

"The difference is that, with an aqueous silver nitrate solution, zinc sulfate (and other sulfates) will grow white needles, while melamine will not," he said. "Melamine can be distinguished from sodium chloride (and other chlorides) by the rapid white encapsulation following aqueous silver nitrate addition to the chlorides. Melamine shows no reaction with silver nitrate addition," he concluded.

However, agricultural microscopy is extremely useful in determining various other adulterants in protein feedstuffs, Cruywagen stressed. "Fish meal, for example, is sometimes adulterated with hydrolyzed feather meal, poultry by-product meal, or meat and bone meal. Poultry manure has even been observed in a fish meal sample. With the current ban of ruminant products in animal feeds, agricultural microscopy is an extremely valuable tool to detect animal protein sources and bone spicules in animal feeds."

NEXT STEPS

In the end, the consensus opinion among the USP workshop participants was that two methods—one general (Kjeldahl or Dumas) and one specific (amino acid analysis)—will be required to ensure protein quality in trade. This two-pronged approach could also be useful in detecting adulteration of other commodities, they noted.

In a parallel project funded by the United Soybean Board, AOCS is acting to improve amino acid analysis of whole seeds by setting performance criteria for the most popular methods of amino acid analysis. Although current methods of amino acid analysis are time consuming, laboratories are committed to whichever method they use for many reasons, including the high cost of equipment. Therefore, instead of developing an official method, AOCS is working with government, industry, and academic collaborators to set performance criteria for the methods currently in use. An initial study took place in 2008 and a second study with additional collaborators is set for October 2009. Contact Amy Johnson at amyj@aocs.org for more information about participating in this or future studies.

For its part, USP is working on making final a 100-page article on the history of protein methodology detailing the pros and cons of each method. The article will be submitted soon to a peer-reviewed journal; USP will then publish pieces of the article in the trade press. In addition, the USP Food Ingredients Intentional Adulterants Advisory Panel "is looking for ways to fast-track analytical changes to USP monographs," Jim Griffiths said. Griffiths is USP's vice president of food, dietary supplement, and excipient standards. The panel also is developing a comprehensive list of potential adulterants covering all subclasses of proteins. "Protein issues cut across many sectors," he noted, "including cereal, oilseed, meat,

and dairy." Analytical methodology, however, remains USP's top priority.

"Protein adulteration is a complex problem," said Markus Lipp, director of food standards for USP, adding that all national and international regulations regarding protein in trade make reference to specific methods (generally Kjeldahl). "To change all of these will require the collaboration and cooperation of many different stakeholders as well as a detailed understanding of what the changes would entail and how they would impact the supply chain," he noted.

"Many AOCS constituents produce and use protein concentrates in their daily business activities," AOCS Technical Director Richard Cantrill emphasized. "The assurance of quality and safety relies on the frequent use of appropriate methods of analysis."

Catherine Watkins is associate editor of inform and can be reached at cwatkins@aocs.org.

*inform*ation

See the October 2009 issue of *inform* for a related article by Christopher Mulligan of Illinois State University in Normal (USA). Mulligan will expand on his presentation at the 100th AOCS Annual Meeting & Expo in May 2009 entitled "Portable Mass Spectrometry for In-the-Field Screening Analytics."

AOCS methods pertaining to protein are available separately for purchase online or as part of the newly revised *Official Methods and Recommended Practices of the AOCS* (*6th* Edition). The methods pertaining to protein content are Aa 5-91, Ab 4-91, Ac 4-91, Ai 4-91, Ba 4a-38, Ba 4c-87, Ba 4b-87, Ba 4d-90, Ba 4e-93, Ba 4f-00, Ba 10-65, Ba 10a-05, Ba 10b-09, Bc 4-91, and Cc 8d-55. Other methods pertaining to protein are Aa 5-38. Aa 5-91, Ab 4-50, Ab 4-91, Ac 4-41, Ac 4-91 Ai 4-75, Ai 4-91, Bc 4-49, and Bc 4-91. For more information, visit www.aocs.org/tech/methods.cfm.

More information about the enzymatic detection process developed at the University of Minnesota is available from Bioo Scientific at support@biooscientific.com.

The FDA methods for melamine analysis are available at www.fda.gov/AnimalVeterinary/ScienceResearch/ToolsResources/ucm135002.htm.

Presentations from the USP workshop on food protein adulteration can be found at www.usp.org/meetings/workshops/foodProteinWorkshop2009.html.

AOCS Press Book of the Month

Featuring a Books Plus Product!

Bleaching and Purifying Fats and Oils

***Theory and Practice*, 2nd Edition**

Gary R. List, Editor

2009. Hardbound. 285 pages. ISBN 978-1-893997-91-2.

SAVE $30

Books Plus CD-ROM

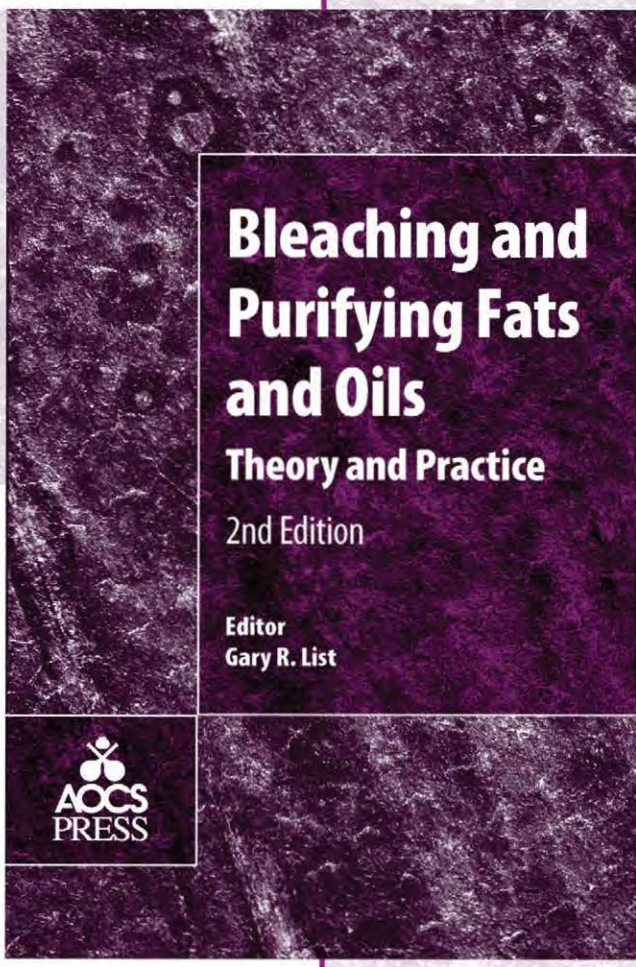
Product code PKG-220

Nonmember: $308 • AOCS Member: $255

Sale prices

Nonmember: $278

AOCS Member: $225



Since the original publication of this book in 1992, the bleaching process has continued to attract the attention of researchers and the edible-oil industry. In this 2nd edition, the reader is directed to more modern techniques of trace-metal analysis such as flame-atomic adsorption, graphite furnace atomic adsorption, and atomic emission spectrometry involving direct current plasma (DCP) and inductively coupled Plasma (ICP). It also discusses the Freundlich Equation and reports on high-temperature water extraction, high- temperature oxidative aqueous regeneration, and extraction with supercritical CO2. Finally, various degumming methods improved over the past several decades are discussed.

Contents

- Basic Components and Procedures
- Adsorption
- Adsorbents
- Bleaching of Important Fats and Oils
- Bleachers
- Filtration and Filters
- Oil Recovery
- Safety, Security, and the Prevention of Error
- Important Tests Relating to Bleaching
- The Freundlich Isotherm in Studying Adsorption in Oil Processing
- Enzymatic Degumming of Edible Oils and Fats

To order:

www.aocs.org/store

Phone: +1-217-693-4803

Fax: +1-217-693-4847

Email: orders@aocs.org

Mention Promo Code BOM0909 when ordering to receive discount.

Offer expires October 16, 2009

AOCS "Books Plus" CD-ROMs let you access an entire book in a lightweight, portable, and completely searchable CD-ROM. Of course, in the **AOCS "Books Plus"** product the standard book is also included for your home, school, or office use.

Recasting the pathway—Teaching plant lipid biochemistry by analogy

Crystal L. Snyder and Olga P. Yurchenko

For a fortunate few, the biochemical pathway is a thing of beauty, an eloquent representation of life's complexities rendered conveniently on the page. For many students, however, it's merely part of the required pain and suffering, as they face the daunting task of committing a dizzying maze of substrates, enzymes, and co-factors to memory for the first time. Introductory biochemistry textbooks, by their weight alone, offer little consolation to students who find themselves overwhelmed by the volume of information they are expected to absorb and retain. Once conquered, the textbook becomes an old friend, revisited again and again as student becomes professor and as that professor, in turn, faces a new challenge of teaching the material in an effective and engaging way.

Lipid biosynthesis is often taught as it is laid out in textbooks—the steps involved in fatty acid biosynthesis, followed by those involved in triacylglycerol (TAG) bioassembly, with some attention paid to membrane synthesis and composition. As catalysts, the enzymes involved become convenient landmarks for navigation—acetyl-CoA carboxylase, fatty acid synthase, the acyltransferases of the Kennedy Pathway involved in glycerolipid assembly. In lipid science, most of the pathway can be considered at least conceptually as a linear process with few branch points. Nevertheless, this treatment has its limitations, as we recently discovered while organizing a literature review on acyl-CoA binding proteins (ACBP), which are involved in the maintenance of the acyl-CoA pool. As ACBP are neither an enzyme nor a substrate in the pathway, it was inherently difficult to highlight the essential role of ACBP using the familiar, enzyme-focused, linear description of lipid biosynthesis as a starting point.

Acyl-CoA is a major intermediate in lipid biosynthesis and degradation, acting as a substrate in glycerolipid assembly, wax synthesis, β-oxidation, and certain acyl modification reactions, such as fatty acid elongation beyond C18. Considering the central importance of acyl-CoA in these processes, it occurred to us that we needed to tell the same story, but with acyl-CoA cast as the main character and the enzymes given supporting roles. Building on this analogy of lipid biosynthesis as "plot" and acyl-CoA as "protagonist" offered an insightful, fresh perspective on the familiar pathway, in which ACBP became the ubiquitous "sidekick," or partner, to our story's hero, essentially a Robin to our Batman. This not only solved our fundamental problem of how to appropriately showcase the role of ACBP in the context of various reactions in lipid biosynthesis but also suggested a useful way of teaching lipid biochemistry using acyl-CoA as a central, unifying, molecule (Fig. 1).

With acyl-CoA cast as the lead character, the stage was set for an exploration of its biochemical properties, notably, its high-energy thioester linkage, which is analogous to the more familiar phosphate bonds in ATP. The amphipathic structure of acyl-CoA imparts detergent-like properties, which intuitively suggest a need for a binding partner, such as ACBP, to prevent the spontaneous

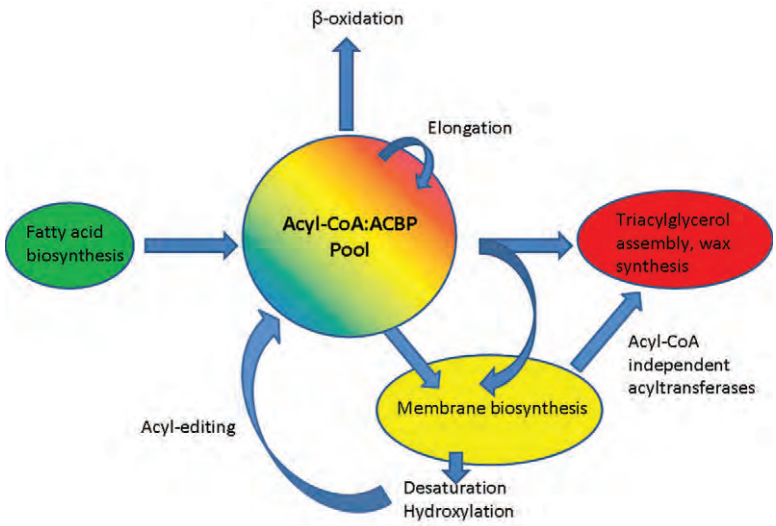


FIG. 1. *Casting acyl-CoA as the lead character: An "acyl-CoA-centric" overview of plant lipid biochemistry.*

formation of micelles and interference with membranes. Several recent studies suggest that ACBP plays an essential role in maintaining the acyl-CoA pool and in mediating substrate availability for glycerolipid biosynthesis (Faergeman *et al*., 2007; Xiao and Chye, 2009).

Lipid biosynthesis itself can now be conceptually divided into the formation of the acyl-CoA pool, acyl group modification and exchange, and utilization of acyl-CoA by the acyltransferases involved in glycerolipid assembly. The formation of the acyl-CoA pool can be considered the net result of *de novo* fatty acid synthesis and the release of polyunsaturated acyl groups from phospholipids through various mechanisms of acyl-editing. Although this latter process of acyl-exchange has long been recognized, it has only recently been demonstrated to play a major role in overall patterns of acyl-group trafficking during plant lipid biosynthesis (Bates *et al*., 2009). Thus, it may be more appropriate to consider the formation of the acyl-CoA pool through all the various mechanisms, rather than adhering to the strictly linear approach of fatty acid biosynthesis followed by TAG assembly.

Note that this approach also emphasizes the mixed composition of the acyl-CoA pool, which in turn helps explain the diverse composition and distribution of acyl groups in TAG. It is tempting for beginning students to treat "acyl-CoA" as a single chemical entity, when in fact the term comprises a variety of acyl groups that are utilized in lipid biosynthesis to different extents depending on their availability and the inherent substrate preferences of the enzymes that must compete for them. A convenient analogy to illustrate this concept is to consider a bag of colored candies (e.g., Smarties® or M&M'S®) as the acyl-CoA pool and a group of student volunteers as acyltransferases. All students are simultaneously allowed to draw from the bag, according to their preference. One student might take only red candies, while another might be happy to choose both blue and green candies. Assuming an equal distribution of all the available colors, we would say that the first student is selective for red candies.

Now, if we change the composition of the pool, say, by offering only one color of candy at a time, the student may choose a different color with lesser preference. If the student abstained in the absence of red candies, we could say that s/he is both specific and selective toward red candies. Through several rounds of this demonstration, it becomes obvious how a few different acyl-CoA species (colors) can account for the diverse array of molecular species of TAG that occur in seed oils. Students acquire an appreciation of the acyl-CoA pool as a dynamic entity, as well as for the influence of acyltransferase specificity and selectivity in the overall process of lipid biosynthesis (Snyder *et al*., in press). It is easy to envision how, with the addition of a few more students (enzymes), this demonstration could be extended to include acyl-editing as a means of altering the composition of the acyl-CoA pool, and how binding proteins such as ACBP might influence the availability of certain acyl groups. The best part, of course, is that everybody gets to eat candy—what better way to make biochemistry more palatable than to literally make it edible?

These are just two possible analogies representing a small part of lipid science as a whole, but they do demonstrate how a subtle shift in our own frame of reference can uncover unique and informative teaching strategies. In this case, the examination of acyl-CoA as a unifying theme in lipid biochemistry also illustrates how a simplified "big picture" can provide a logical scaffold upon which the details can be more readily organized and understood. Indeed, it is only through acquiring an appreciation of the universal logic underlying biochemical processes that the true beauty of biochemistry is brought to light.

Crystal L. Snyder and Olga P. Yurchenko are both members of the Department of Agricultural, Food & Nutritional Science, University of Alberta, Edmonton, Alberta, Canada. Crystal Snyder can be contacted at crystal.snyder@ales.ualberta.ca.

information

For further reading:

- Bates, P.D., T.P.,Durrett, J.B. Ohlrogge, and M. Pollard, Analysis of acyl fluxes through multiple pathways of triacylglycerol synthesis in developing soybean embryos, *Plant Physiol. 150*:55–72, 2009.
- Faergeman, N.J., M. Wadum, S. Feddersen, M. Burton, B.B. Kragelund, and J. Knudsen, Acyl-CoA binding proteins; structural and functional conservation over 2000 MYA, *Mol. Cell. Biochem. 299*:55–65, 2007.
- Snyder, C.L., O.P. Yurchenko, R.M.P. Siloto, X.,Chen, Q. Liu, E. Mietkiewska, and R.J. Weselake, Acyltransferase action in the modification of seed oil biosynthesis, *New Biotechnology*, in press, doi:10.1016/j.nbt.2009.05.005.
- Xiao, S., and M. Chye, An *Arabidopsis* family of six acyl-CoA-binding proteins has three cytosolic members, *Plant Physiol. Biochem. 47*:479–484, 2009.

News & Noteworthy

Briefs

Cargill (Minneapolis, Minnesota, USA) announced in July that it would cease hydrogenated oil production at its Wichita, Kansas, USA, facility. Remaining hydrogenation production will be moved to other Cargill facilities.

In other company news, Cargill has assumed full ownership of NatureWorks, LLC. Previously a 50:50 joint venture with Teijin Ltd. of Osaka, Japan, NatureWorks is now an independent company wholly owned by Cargill. NatureWorks manufactures biobased plastics and resins.

Also in July, Cargill opened its new animal feed mill in Efremov, Russia. The feed mill represents a further investment of $12.5 million at the company's industrial complex there, which is located 300 kilometers south of Moscow. The facility has the capacity to produce 250,000 metric tons/year of feed, according to a written statement made by Cargill Russia.

■■■

The European Food Safety Authority (EFSA) announced the results of its first study on pesticide residues in foods. The research found that 4% of the 74,000 study samples did not comply with legal maximum residue levels for the chemicals. The report is available at www.efsa.europa.eu/EFSA/efsa_locale-1178620753812_1211902667778.htm.

■■■

Ethiopia's oilseed exports have outpaced coffee as the country's biggest earner in the 11 months from July 2008 to May 2009, according to the Reuters news agency. The country is Africa's leading coffee producer and is the world's fourth largest exporter of sesame seeds. Ethiopia received $326 million from the sale of 261,216 metric tons (MT) of oilseeds, primarily sesame, and another $321 million for 114,442 MT of coffee over the July–May period, Reuters said.

■■■

The European Food Safety Authority (EFSA) has set up a web page detailing its work on aflatoxins—the myc-

CONTINUED ON PAGE 570

Courtesy Fernando Weberich

CAST looks at soybean sustainability

The Council for Agricultural Science and Technology (CAST) has released a report on the environmental sustainability of US soybean production. Commissioned by the United Soybean Board, the report is available at www.soyconnection.com/pdf/9001_USB_CAST_V1r1May11.pdf.

CAST defines sustainability practices as:

- Adopting technology and best practices that increase productivity to meet future needs while being stewards of the environment,
- Improving human health through access to safe, nutritious food, and
- Enhancing the social and economic well being of agriculture and its communities.

KEY FINDINGS

The overriding conclusion of the CAST report is that all three of the major soybean production systems (conventional, biotech, and organic) are environmentally sustainable and can be managed for profit, assuming that appropriate market rewards exist for each system.

The primary environmental benefit of sustainable farming is the rise of conservation tillage. Today, biotechnology-derived crops have enabled farmers to almost completely eliminate the need for plowing on their fields. Benefits of conservation tillage include soil preservation, reduced CO_2 emissions, water contamination reduction, and reduced herbicide run-off.

The CAST report determined that over 92% of US soybean acres are planted with soybean varieties developed through agricultural biotechnology. Biotech soybean acreage is estimated to have increased by approximately 11 million acres from 2003 (almost 58.6 million acres) to 2009 (more than 69.6 million acres). These currently commercialized biotechnology-derived crops yield environmental benefits, primarily by supporting conservation tillage, or "no-till farming," on more fields than previously implemented.

"No-till" farming was feasible on a limited number of farmland soil types and in a limited number of US latitudes prior

otoxins produced by at least four species of *Aspergillus*, a fungus that is prevalent in hot and humid climates. The page is available at http://www.efsa.europa.eu/EFSA/efsa_locale-1178620753812_1211902632818.htm?WT.mc_id=EFSAHL01. In related news, EFSA's Scientific Panel on Contaminants in the Food Chain has recommended raising the maximum allowable levels of the toxic mold from 4 µg/kg to 10 µg/kg for all tree nuts.

■■■

The UK's Food Standards Agency has published its latest report on process contaminants in foods. The contaminants tested for in 2008 include acrylamide, furan, free 3-MCPD (3-monochloropropanediol) and ethyl carbamate. The report is available at www.food.gov.uk/science/surveillance/fsisbranch2009/survey0309.

■■■

Leatherhead Food International has changed its name to Leatherhead Food Research. The company is based in Leatherhead, Surrey, UK, and is celebrating its 90th anniversary.

■■■

The International Society for Nutraceuticals and Functional Foods has established several awards, including the Fereidoon Shahidi Fellowship Award for graduate students; the Industry Merit Award; and the Award for Outstanding Research, R&D, or Service in the Functional Foods and Nutraceuticals area. Best poster awards for students will be presented during the annual conference on November 1–4, 2009, in San Francisco, California, USA. For more information, visit http://isnff.org. The deadline for award applications is October 5, 2009. ■

to the arrival of biotech crops. Today, advances in agricultural biotechnology, CAST says, have made the widespread adoption of no-till farming possible.

Rich Joost, USB's director of production research and a member of the CAST Board of Directors, added, "From 1996 to 2002, conservation tillage increased by 35%, for use on over 65% of US soybean acres. Given the increase in biotech soybean plantings since 2003, it is reasonable to infer that conservation tillage has increased dramatically over the past seven years as well."

The benefits of conservation tillage include:

- A 93% decrease in soil erosion,
- Preservation of one billion tons of top soil,
- Annual soil moisture evaporation loss reduction of 5.9 inches,
- A 31% decrease in wind erosion,
- An 80% reduction in phosphorus contamination of surface waters,
- A 70% reduction in herbicide runoff,
- A reduction in CO_2 emissions of 326 million pounds, and
- A greater than 50% reduction in fuel use.

Conservation tillage is both economically and environmentally sustainable for US soybean production, the CAST report asserts.

An estimated 800 million people around the world suffer from chronic food shortages, and millions more could go hungry due to the current and future food crises. To address these needs, the United Nations has called for a 50% increase in food production by 2030.

High-yield soybean crops can help feed a growing world population with high-quality protein. Using biotechnology-derived soybean varieties also results in improved weed control and better weed management efficiency. Plants that resist pests and diseases, tolerate harsh growing conditions, and reduce spoilage prevent farmers from losing billions of pounds of important food crops annually.

CONCLUSIONS

As stated above, the CAST report concluded that conventional, biotech, and organic soybean systems are all environmentally sustainable and can be managed for profit with appropriate market incentives when proper practices and technologies are used.

Production practices are evolving to ensure the continued sustainability of soybean production in the US. These innovations include: improved production and management practices; advances in breeding and variety development; and new or improved materials and methodology for disease, nematode, insect, and weed management.

However, conventional, biotech, and organic systems are not equally viable to meet current and future needs. CAST report findings indicate that US soybean production now has a "new" conventional system that is based on using biotechnology. In addition to no-till agriculture, biotech soybeans reduce farmers' needs to use pesticide applications, thanks to targeted pest control methods. In addition, new traits will improve water quality through decreased phosphorus waste deposition from livestock feed.

"Agricultural biotechnology is a key tool for meeting the needs of a growing global population over the next two decades. Biotechnology-derived soybeans, planted on over 66.5 million hectares (164 million acres) worldwide, increased world production by 32 million metric tons in 2007. Continued development and adoption of biotech traits will be essential to meeting the goal of feeding the world's hungry while providing environmental sustainability through enhanced conservation of soil and water and improved water and air quality.

Unilever nixes *trans* fat in spreads

Anglo-Dutch Unilever, one of the world's largest consumer products companies, announced in July that all of its US soft spread brands sold in tubs will have no partially hydrogenated oils and therefore no *trans* fatty acids (TFA) per serving by the second quarter of 2010.

"After an extensive three-year research and development effort, Unilever has begun removing the partially hydrogenated vegetable oil from I Can't Believe It's Not Butter!®, Brummel & Brown®, Shedd's Spread Country Crock®, and Imperial® soft spread products sold in tub formats,

CONTINUED ON PAGE 572

Acquisitions/ mergers

The Brazilian company **Amaggi** has entered into an agreement to buy fellow Brazilian company **Agrenco's** 40% stake in **Denofa AS**, as well as an 11% stake from **Norgrain**, leaving Amaggi with 51% of the ownership of Denofa. Norgrain continues its ownership in Denofa and will now have 49% of the shares. Denofa is a supplier of soy oil, protein, and lecithin and is based in Fredrikstad, Norway.

■■■

Dow AgroSciences LLC (Indianapolis, Indiana, USA) has acquired a majority of the assets of Illinois-based corn company **Pfister Hybrids**. Pfister will continue to have headquarters in El Paso, Illinois, USA, according to the Associated Press news service.

Commodities

CACAO/CHOCOLATE

Mars Botanical (Rockville, Maryland, USA) has introduced a new flavanol-rich cocoa extract for functional products meant to maintain healthy circulation. Called "Cirku," the extract contains around 550 mg of flavanols/gram, Mars said The company also is selling a beverage powder mix called CirkuHealth online, directly to consumers.

CANOLA/RAPESEED OIL

Bio-Extraction Inc. (BioExx), an oilseed and protein extraction firm based in Toronto, Ontario, Canada, is building a new canola processing plant in Minot, North Dakota, USA. The plant will have the capacity to process 80,000 metric tons of canola per year, according to BioExx. Construction will begin in 2010 and the facility should open in 2011.

■■■

Finnish meat product company **Kotivara** has introduced **rapeseed oil-containing salami**. The fat content is below 10%, and half of the fat is rapeseed oil, according to a report by *Kehittyvä Kauppa*, a Finnish periodical.

Researchers led by S. Mill of the University of the Basque Country in Vitoria, Spain, have developed a rapid method for the speciation and quantification of **glucosinolates in rapeseed**. The method combines liquid chromatography (LC) with ion trap mass spectrometry (ITMS) detection. The method appeared in *Analytical and Bioanalytical Chemistry* (*394*:1661–1669, 2009).

■■■

High-ozone conditions produce a 30% decrease in yield and an increase in the concentration of glucosinolates within oilseed rape plants, according to research presented at the Society for Experimental Biology Annual Main Meeting in Glasgow on June 29, 2009. Maarten De Bock of the University of Antwerp presented the study.

■■■

Yum! Restaurants, owners of the **KFC** fast-food franchise, will switch from palm oil to a blend of canola and sunflower oils in their Australian restaurants. **Restaurant Brands**, which operates KFC in New Zealand, will also adopt the canola/sunflower oil blend, according to the Canola Council of Canada.

COCONUT OIL/COPRA

The **Coconut Industry Investment Fund (CIIF) Oil Mills Group** spent about $16.6 million for coconut development projects in 2008, the head of the group told BusinessWorld online, a news service based in Manila, Philippines. From September 2008 to June 2009, CIIF planted about 29 million seedlings on more than 290,000 hectares, the report said.

FISH OIL/MEAL

Farming fish to feed the planet is the topic for an editorial of *Cahiers Agricultures* (*18*:82–90, 2009) in a special issue looking at the future of fish farming. An interview with Jérôme Lazard, a specialist in aquaculture at **CIRAD** and coordinator, with René Lésel, of the special issue, is available online in English at http://www.cirad.fr/en/actualite/communique.php?id=1153. CIRAD is the French Agricultural Research Centre for International Development.

■■■

The **US National Oceanic and Atmospheric Administration** published a final rule in the *Federal Register* on July 13, 2009, prohibiting the harvesting of krill in the Exclusive Economic Zone off the coasts of the US states of California, Oregon, and Washington. The rule went into effect on August 12, 2009. Krill are a small shrimp-like crustacean and a key source of nutrition in the marine food web as well as a source of omega-3 fatty acids, phospholipids, and astaxanthin.

PALM OIL

Madhya Pradesh-based edible oil manufacturing company **KS Oils** has acquired an additional 35,000 acres (about 14,000 hectares) of land in Indonesia for oil palm plantations, according to India's *Economic Times* newspaper. With this acquisition, the total land acquired by the company in Indonesia stands at 85,000 acres, the article said.

SOY OIL

Noble Argentina S.A., a wholly owned subsidiary of **Noble Group** of Hong Kong, will build a soybean crushing plant in its port terminal in Timbues, Santa Fe Province, Argentina. Noble said in a news release that it estimates the cost of the three-million-metric-ton plant at $230 million; the complex should open in the first quarter of 2010.

SUNFLOWER OIL

Ukraine exported almost 1.8 million metric tons of sunflower oil, an increase of 51.8% year-on-year over ten months of the 2008–2009 marketing year (Septem-

CONTINUED ON PAGE 574

thereby eliminating the artificial *trans* fats in these products," the company said in a news release.

Unilever also said it will work to keep the saturated fat content of these spreads as low as possible (2 grams or less per serving) by reformulating with a mixture of palm oil and interesterified fat. After reformulation, the spreads will then have 0.05 grams/serving of TFA.

The company did not respond for requests for comment on its plans elsewhere in the world.

New research lab debuts

A new laboratory at Iowa State University in Ames (USA) that carries out quick identifications of antimicrobial and prebiotic compounds is available to researchers working on preventing food spoilage, improving food quality, controlling foodborne pathogens, or enhancing growth of probiotic bacteria.

The Discovery Lab allows researchers to test various plant, microbial, or animal sources to determine whether they have antimicrobial or prebiotic properties. The Lab is housed within the university's Center for Crops Utilization Research.

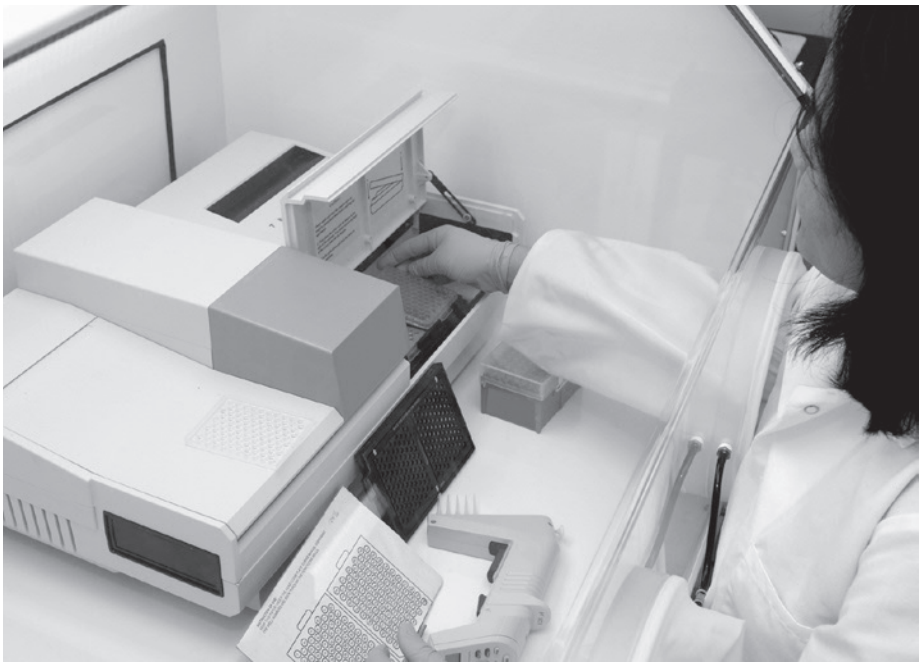
"The Discovery Lab is unique in that it uses cost-effective approaches to rapidly obtain growth measurements of microorganisms using a minimum of equipment and space," said Aubrey Mendonca, professor-in-charge of the Discovery Lab.

The Lab operates two Bioscreen C Growth Curve units to perform automated growth curve determinations of aerobic or anaerobic microbes under a variety of conditions. A wide variety of foodborne pathogens and bacteria as well as selected yeasts and molds can be evaluated.

"The units are capable of incubating and evaluating up to 200 different microbial cultures and their growth parameters in a single experiment," said Mendonca. "Data can be generated in a few days compared to several months using conventional techniques."

Researchers at Iowa State use the Bioscreen units to test antimicrobial compounds against pathogens such as *Escherichia coli, Staphylococcus aureus, Listeria monocytogenes,* and *Salmonella* spp. In addition, the lab includes a Bioscreen unit mounted in an anaerobic chamber that allows scientists to study anaerobes including probiotic and ruminant bacteria.

Other equipment in the Discovery Lab includes analytical and preparative high-pressure liquid chromatographs, a UV-visible spectrophotometer, an organic spray dryer, and laminar-flow hoods. The lab can provide both analytical and preparative services to clients on a fee basis for on- and off-campus users.



A researcher uses a Bioscreen unit in the anaerobic chamber at Iowa State University's new Discovery Lab. Courtesy of the Center for Crops Utilization Research.

New high-oleic soy oil standard

A proposed new standard intended to help ensure the quality of high-oleic soybean oil once it is incorporated into food production has been developed. The standard will be included in the *Food Chemicals Codex (FCC)*, a compendium of internationally recognized standards that designates the quality and purity of food ingredients used by food product manufacturers. The US Pharmacopeial (USP; Beltsville, Maryland, USA) Convention, which publishes the *FCC*, is seeking comments on the standard from the food industry as well as all other interested parties.

The proposed standard is included in the latest *FCC Forum*, the mechanism through which USP accepts public comment on standards before the final standard is published in the compendium. The *FCC Forum* is now accessible at www.usp.org/fcc/forum.

The proposed standard will be available for public comment through September 30, 2009. After this comment period, USP's Food Ingredients Expert Committee—a group of independent scientific experts—will review all feedback and create a final standard. This will be included in the *FCC's* Seventh Edition, which will be available in February 2010.

Consumers' attitudes on soy

Eighty-four percent of US consumers rate soy products as healthful, according to the recently completed 16th Annual Consumer Attitudes about Nutrition Study, funded by the US Soybean Checkoff. Another result: 87% of consumers express concern about the nutritional content of the food they eat. The number of concerned consumers has remained consistent over the last 11 years, according to the United Soybean Board, a trade association based in St. Louis, Missouri, USA.

The ailing economy seems to be having an effect on US consumers' buying decisions as nearly half (46%) report that

Ghent University in Belgium invests in new cocoa laboratory

Willem van Nieuwenhuyzen

OPENING CEREMONY

Chocolate processing is an important research area for the faculty of bioscience engineering at Ghent University (Belgium). A new cocoa laboratory, UGent Cacaolab, was inaugurated there on Tuesday, June 2, 2009, with an official academic ceremony. Koen Dewettinck, an AOCS member and officer for the AOCS Food Structure & Functionality Forum Division, participated in the opening. He is also head of UGent's Laboratory for Food Technology and Engineering.

Guido Van Huylenbroeck, dean of the faculty, joined Dewettinck in the opening ceremony. Academic presentations were delivered by Emmanuel Afoakwa (University of Ghana, Legon), who spoke on "Quality function deployment during industrial chocolate manufacture in Ghana," and Kevin Smith (Unilever Research, Colworth, United Kingdom), who considered "Putting the snap into chocolate." Industry representatives gave their vision on cocoa and chocolate markets and the cooperation between academia and industry: Patrick Hautphenne of Barry Callebaut (Zurich, Switzerland) spoke about food trends through innovation; Caroline Ouwerx of Belcolade (Erembodegrem, Belgium) about innovation through taste; and Filip Buggenhout of Cargill Chocolate Products (Mouscron, Belgium) about chocolate quality and quality fade. The last speaker, Frédéric Depypere of Ghent University, outlined the targets and described the facilities of the UGent Cacaolab.

BACKGROUND

Belgian chocolate brands compete with Swiss chocolates for world leadership in terms of technology, quality, and consumer acceptance. Crystallization of dairy and vegetable fats in chocolate products is an important scientific challenge for the UGent Cacolab group. The undesired fat bloom of chocolate during storage on the shelf is evidenced by white crystals of fat on the chocolate surface, making the product unattractive for consumption both in visual and sensory terms. The formation of the correct fat crystal form and the prevention of recrystallization is an ongoing topic for research. Chocolate is strongly linked to the crystallization and polymorphic behavior of the fat phase. Cocoa butter (CB), CB equivalents, and CB replacers should crystallize, in a controlled way, into the desired beta crystal form, giving the chocolate sufficient contraction, hardness, and shelf life. The University of Ghent research group decided to install a chocolate laboratory capable of preparing chocolate recipes for scientific research purposes and processing improvements.

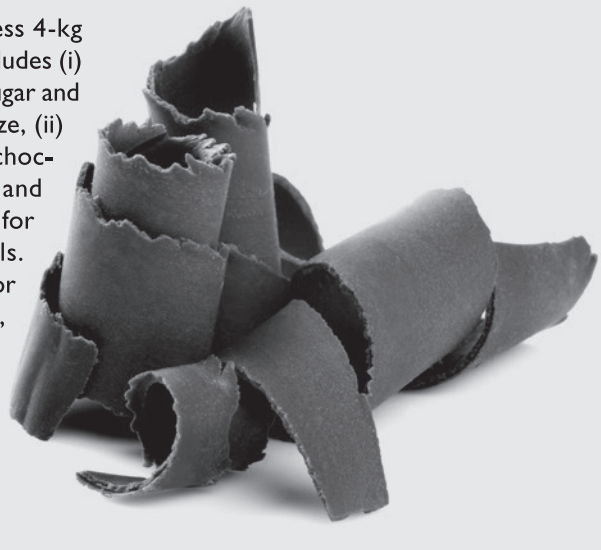
COCOA LABORATORY FACILITIES

The cocoa laboratory can process 4-kg samples. Available equipment includes (i) a three-roll refiner for grinding sugar and cocoa particles to the desired size, (ii) a conche for making the liquid chocolate mass with good viscosity and flavor, and (iii) a tempering unit for forming the correct CB crystals. Optimal processing is required for the correct gloss, hardness, snap, bite, and mouthfeel. Fillings can also be made; this capability is essential for ongoing research into the prevention of fat migration of low-melting filling compounds into the surrounding chocolate layer. Process steps can be controlled by different analytical tools, such as particle size distribution, rheology, crystal structure by NMR (nuclear magnetic resonance), DSC (differential scanning calorimetry) and X-ray techniques, and microscopy. The laboratory is focused not only on fundamental research projects but also on application support for companies.

FOOD2KNOW

Laboratory activities of the UGent Cacaolab fit with the targets of the Belgian Center of Excellence "Food2Know," in which 35 laboratories and institutes cooperate. For further cocoa laboratory information about joint or contract research, please contact Koen Dewettinck at Koen.Dewettinck@UGent.be, Frédéric Depypere at Frederic.Depypere@UGent.be, or visit www.fte.UGent.be.

inform *Contributing Editor Willem van Nieuwenhuyzen is director of Lecipro Consulting, the Netherlands, and can be reached by email at willem@lecipro.nl.*



they are unwilling to pay more for more healthful foods and 52% of those consumers cite the reason as financial. However, soy is one of the foods that consumers seek out, with 30% of consumers buying products specifically because they contain soy. Approximately 31% of consumers are aware of specific presumed health benefits of soy in their diet.

Soy's image as a healthful product has increased in the minds of consumers over time. The number of consumers rating soy products as healthful has seen a dramatic 25% increase over the last 12 years. In other results, 69% of respondents view *trans* fat as very unhealthful, which is a significant increase from 2000, when only 38% viewed *trans* fat as very unhealthful.

ber 2008–August 2009), according to the *Ukraine Business Daily* newspaper.

New ventures

Global specialty chemicals supplier **Cognis**, based in Monheim, Germany, is endowing a chair of communications and management of chemical processes in industry at the **University of Wuppertal** in Germany. The aim of the endowment is to promote teaching, research, and development activities relating to sustainable chemistry. Cognis will fund the post for three years, after which time the costs will be borne by the university.

■■■

Loders Croklaan is building a new refinery at the Maasvalkte in Rotterdam, Netherlands, scheduled to open in the second quarter of 2010. According to FoodNavigator.com, the company will expand its range with lauric products from palm kernel oil and will begin large-scale enzymatic interesterification for the first time. Loders is based in Wormerveer, Netherlands, and is a subsidiary of Malaysia's IOI Corp. Bhd.

■■■

Switzerland's **Nestlé**—the world's largest food company— is co-funding a chair in bioplastics at the **École des Mines** in Paris. This research program will study the properties of polymers derived from renewable resources, as well as their industrial application. Other funders of the research program are **Schneider Electric**, **PSA**, **Arkema**, and **L'Oréal**.

■■■

CrispTek LLC of Columbia, Maryland is now marketing a new rice batter product developed and patented by the US Agricultural Research Service. The batter is said to absorb up to 50% less cooking oil than traditional batters.

■■■

Cargill (Minneapolis, Minnesota) has introduced its Ingeo™ bioplastics from **NatureWorks** to Brazil through Cargill's Starches and Sweeteners business unit, the company said in July.

■■■

Jaiprakash Associates, best known for its presence in the construction and hydroelectric power sectors, plans to process and market edible oil under its own brand as part of a venture into the agribusiness segment. The Delhi-based group will process soy and mustard oil and produce oil cakes, according to *The Economic Times* newspaper of India.

Eurofins Scientific, Inc., a provider of analytical and technical support services to the international agri-food industry, has expanded its services to include food safety management system audits and certifications for the North American market. The company has assumed the SQF (Safe Quality Food) license formerly held by **Quality Auditing Institute, Ltd.**, which has ceased its food sector operations. Eurofins will offer SQF audits in the North American market under the umbrella of its sister company, **Eurofins Certification**, an accredited certification body based in France.

■■■

Specialized Technology Resources (Enfield, Connecticut, USA) reports that it recently relocated to a new 75,000 sq. ft. (7,000 sq. m.) facility in Shenzhen, China, nearly doubling the size of its quality assurance testing laboratories there for customers in the Asia-Pacific region.

R&D

Consumers participating in a taste test favored a **mayonnaise** made with **rice bran oil** (RBO) and **soy protein concentrate** (SPC) over a traditional mayonnaise made from egg, vinegar, vegetable oil, and spices. Researchers led by Karen Garcia of Louisiana State University in Shreveport (USA) conducted the test. According to the study results, the optimal formulation range was 37–43% RBO, 4%–7% SPC and 52–57% water. The research appeared in the *Journal of Food Science* (*74*:248–254, 2009).

■■■

Cargill (Minneapolis, Minnesota) announced that it has opened a new canola research and production center just outside of Saskatoon (Saskatchewan, Canada) to work on the oilseed's genetics in an attempt to make the crop more resistant to extremes of weather. ■

3-MCPD Proposition 65 priority

Free 3-MCPD (3-monochloropropane-1,2-diol) and 1,3-dichloro-2-propanol have been classified as "high-priority" chemicals for review by the California (USA) Office of Environmental Health Hazard Assessment (OEHHA) under Proposition 65 (California's Safe Drinking Water and Toxic Enforcement Act of 1986). Proposition 65 regulates substances listed by California as causing cancer or birth defects or other reproductive harm.

OEHHA's Carcinogen Identification Committee (CIC) examined 38 chemicals at its meeting on May 29, 2009, to determine the priority with which OEHHA should address them as part of its Hazard Identification material preparation. The CIC recommended that nine be placed in the "high priority" category, 13 in the medium, and the rest in the low. A transcript of the meeting is available at http://www.oehha.ca.gov/prop65/public_meetings/pdf/cicMeetingTranscipt052909.pdf.

Free 3-MCPD and 1,3-dichloro-2-propanol are both process contaminants of interest to the fats and oils industries. See http://www.aocs.org/tech/3-MCPD.cfm for more information.

Added novel food approval for life'sDHA

Martek Biosciences (Columbia, Maryland, USA) has received unanimous approval from the Standing Committee on the Food Chain and Animal Health of the European Commission for additional novel food approval of life'sDHA (Martek's brand of the omega-3 fatty acid docosahexaenoic acid [DHA] from microalgae).

The approval will allow Martek's ingredient to be used in bakery products, cereal bars, and beverages, including milk-based and milk analog drinks, throughout the 27 Member States of the European Union. This expands the approvals granted in 2003, which included breakfast cereals, spreadable fat and dressings, dairy products (excluding milk-based and milk analog drinks), and food supplements. ■

Briefs

The biodiesel and feedstock research and support lab for the seven production plants of Renewable Energy Group (Ames, Iowa, USA) opened on July 28. The laboratory will study a number of potential biodiesel feedstocks, including coffee bean, jojoba, coconut, and karanja (*Pongamia glabra*) oils. The laboratory was funded in part by a grant of $740,000 from the Iowa Power Fund.

■■■

Neste Oil (Espoo, Finland) has increased its capacity to produce NExBTL renewable diesel following the start-up of a second NExBTL plant at the company's main refinery at Porvoo, Finland. The new plant is capable of producing 170,000 metric tons (MT) per year of NExBTL. The company's first plant—also at Porvoo and also with a capacity of 170,000 MT—was commissioned in 2007. Neste is building two other NExBTL plants in Singapore and Rotterdam. These are being scaled to produce 80,000 MT per year, and will be completed in 2010 and 2011, respectively.

■■■

The United Nations Climate Change Conference is to be held in Copenhagen in December 2009. World political leaders in attendance will be transported by 40 cars supplied by Volvo and fueled with second-generation bioethanol (made from agricultural waste). The fuel is being formulated by members of the Partnership for Biofuels, a cooperative effort between Danisco's biotech division Genencor, Inbicon, Novozymes, and Statoil. The fuel blend to be used at the Conference is E85 (85% bioethanol, 15% petroleum-based gasoline).

■■■

Senator Clarence William "Bill" Nelson (D-Florida) introduced the Algae-based Renewable Fuel Promotion Act of 2009 (S. 1250) in mid-June. The purpose of the bill is to "amend the Internal Revenue code of 1986" to "expand the definition of cellulosic biofuel to include algae-based biofuel for purposes of the cellulosic biofuel producer credit" and the special allowance for cellulosic biofuel plant property. At the end of July, the bill was with the Finance Committee. ■

Biofuels News

JATROPHA

Philippines to export jatropha oil to United States

The Philippine unit of Abundant Biofuels Corp. (San Jose, California, USA) expects to start exporting jatropha oil to the United States in 2010. About 30 million gallons (110 million liters) will be exported from the lumad (non-Islamized indigenous peoples of Mindanao) plantations in Northern Mindanao. The oil will be used as biodiesel feedstock. The company is offering long-term contracts of up to 10 years in multiples of 50,000 barrels. In an interview with Asia Pulse Pty Ltd., company chairman Charles V. Fishel said, "Longer term, our goal is to limit the amount exported to 40% or less of the total production in the Philippines. Our primary target market is the domestic market."

Abundant Biofuels also grows jatropha in Peru, Indonesia, and the Dominican Republic In April 2009, the company entered a 10-year supply contract with JatrophaBioJet Corp. (see www.jatrophabiojet.com) for five million barrels per year to be used in jet fuel.

D1 Oils acquires BP's portion of joint venture

D1 Oils (London, UK) has agreed to acquire BP's 50% share of their D1-BP Fuel Crops joint venture, which had formed in June 2007 to cultivate jatropha for biodiesel production.

BP indicated it was leaving the joint venture to focus resources on other biofuel projects, including production of ethanol from sugarcane in Brazil (with Tropical BioEnergia SA, Edéia, Goias State) and from cellulose in the United States (with Verenium, Cambridge, Massachusetts), and development of biobutanol (with DuPont).

On the same day that the dissolution of the joint venture was announced, D1 agreed to provide plant science and planting technology and services over a five-year period to Bedford Biofuels, a privately held Canadian company with commercial *Jatropha curcas* plantations in Kenya and Zambia. D1 intends to license on a non-exclusive basis technology acquired through its agronomy research and breeding program to Bedford Biofuels.

CONTINUED ON NEXT PAGE

BIODIESEL

Canola-based biodiesel plant opens in Canada

The grand opening of Milligan Bio-Tech's crushing/biodiesel plant took place in Foam Lake, Saskatchewan, Canada, on July 23. With the pending Renewable Fuels Bill C-33, requiring a 2% renewable fuel content in diesel by 2012, Milligan Bio-Tech anticipates playing an integral part in Canada's plan to reduce greenhouse gas emissions, according to Executive Manager Zenneth Faye. The company was started by a group of innovators in the 1990s with the goal to develop nonfood uses for distressed oilseed crops (off-spec seeds not meeting food quality standards). The plant is the first Canadian biodiesel producer using canola as a feedstock. Co-products include Diesel Fuel Conditioner (DFC), Penetrating Oil, and Road Dust Suppressant (RDS). The company website claims its canola-based biodiesel has a pour point of –15°C.

ALGAE

Solix initiates algal oil production

Solix Biofuels, Inc. (Fort Collins, Colorado, USA) has completed the construction and start of algal oil production at its Coyote Gulch Demonstration Facility. Algal oil production began on July 16, 2009, following the inoculation of the facility with microalgae. The Coyote Gulch Demonstration Facility will be in full-scale commercial operation by late in the third quarter of 2009.

The Coyote Gulch Demonstration Facility is expected to be producing the equivalent of 3,000 gallons of algal oil per acre (28,000 liters/hectare) per year by late 2009. During the peak growth season, microalgae can be harvested every 5–7 days. The total facility is located on a 2-acre (0.8-hectare) site in southwestern Colorado, on land provided by Solix's partner, the Southern Ute Indian Tribe, and is fully integrated with an industrial plant producing CO_2 and water as waste products.

Aquaflow, Solray to produce algal oil

Two companies located on the South Island of New Zealand have agreed to work together to turn algae into fuel. Aquaflow Bionomic Corporation (Nelson) has developed low-cost, low-energy technologies to harvest and store significant daily production of microalgae as well as uses for these algae (see *inform 19*:432–437, 2008).

Aquaflow has expertise in growing algae in open ponds using effluent from sources such as sewage treatment plants, food processing facilities, and dairy farms; it has been working with Honeywell-UOP to develop aviation fuel from oils produced by the algae.

Separate from Aquaflow, Solray Energy (Invercargill/Christchurch, NZ) has developed a reactor and extraction process to detoxify algae and deliver crude oil and other co-products; the oil can then be refined into biofuel. In March 2008, Aquaflow had announced that it was planning to develop a prototype biorefinery to turn algae into fuel. Aquaflow has not yet said whether it is continuing that effort or relying on Solray's system.

Solray says its technology can convert all of the algae, not just the fatty acids, into crude oil that can be refined into gasoline, kerosene, or aviation fuel.

BioCentric Energy harvests algae, negotiates in China

Located in San Juan Capistrano, California, USA, BioCentric Energy Holdings, Inc. has been developing its closed-loop Algae Pro Photobioreactor for growing algae intended for biofuel. Company President Dennis Fisher announced in July that the 1,800 square foot (170 square meter) bioreactor was operating in an "environmentally green" mode, as the system was using only reclaimed water. The first harvest was anticipated early in August, and ultimately Fisher predicted that algae could be harvested twice daily. The organism being grown is *Scenedesmus dimorphus*, which Fisher said can be used "for producing clean-burning jet fuel and gasoline."

BioCentric recently negotiated an agreement with Zhenxing Co., Ltd., a Chinese corporation with offices at Lanhe Town, Panyu District, Guangzhou, China, to jointly develop the Algae Biofuel project in China and to design and manufacture certain components for BioCentric's global operations.

Continuous harvest of algal oil

By using a new "milking" process, OriginOil, Inc. (Los Angeles, California, USA) says it has succeeded in extracting algal oil on a continuous basis without cell sacrifice. Live Extraction™, or milking, is inherently efficient because it achieves continuous production of algae oil without destroying the algae cell.

"Live Extraction works by stimulating the algae cells through specific electrical modulations," said Riggs Eckelberry, OriginOil's CEO, in a company press release. "The challenge is how to keep the cells alive while continuously extracting the oil, and we have achieved this."

By keeping the cells alive, single algal cells can produce more oil during their lifetime, using lower amounts of energy, than if the cells were harvested. Unlike other approaches to live extraction, OriginOil's process does not use expensive consumables such as reverse osmosis membranes; furthermore, it is not limited to oil-bearing algae strains, such as *Botryococcus braunii*, that are known to excrete algae oil naturally.

Live Extraction has been achieved in the laboratory at bench scale and is now being scaled up to OriginOil's intermediate 200-gallon (800-liter) tank size. The company recently filed for patent protection of the Live Extraction process.

ETHANOL

Qteros process achieves 70 g ethanol/L

University of Massachusetts-Amherst (USA) microbiologist Sue Leschine, who discovered the Q Microbe™ (*Clostridium phytofermentans*) near the Quabbin Reservoir in central Masschusetts (*inform*

CONTINUED ON PAGE 578

ExxonMobil to spend $600 million on algae-based fuel R&D

On July 14 ExxonMobil Research and Engineering Company (EMRE) and Synthetic Genomics Inc. (SGI; La Jolla, California, USA) jointly announced a five-year research and development (R&D) agreement for the creation of next-generation biofuels from algae. As part of the multifaceted agreement, SGI will receive milestone payments from EMRE of as much as $300 million, with the potential for additional income from licensing to third parties. ExxonMobil also expects to spend $300 million in internal costs, for a total exceeding $600 million.

This announcement is a significant departure from the path for which ExxonMobil had become famous, as exemplified in a February 2007 speech by Rex Tillerson, the company's chairman and chief executive, who referred to biofuels as "moonshine." After years of the company's public opposition to investment in renewable energy, EMRE's Vice President of R&D Emil Jacobs said in a press release, "This investment comes after several years of planning and study and is an important addition to Exxon Mobil's ongoing efforts to advance breakthrough technologies to help meet the world's energy challenges."

In an interview with *The New York Times*, Jacobs elaborated, "We literally looked at every option we could think of, with several key parameters in mind. Scale was the first. For transportation fuels, if you can't see whether you can scale a technology up, then you have to question whether you need to be involved at all."

For perspective on the scale required, the US market consumes nine million barrels of gasoline each day, according to the *Times*, or about 138 billion gallons (522 billions liters) annually.

Under the terms of the agreement, SGI will work to find, optimize, and/or engineer superior strains of algae. It will define and develop the best system—open (ponds) and/or closed (e.g., tubular) photobioeactors—for large-scale cultivation of algae and for conversion of their products into useful biofuels. EMRE's engineering and scientific expertise will be used throughout the program, from developing systems to scaling up algae production through to manufacturing finished fuels.

Scientists at SGI, which was founded in 2005 by Craig Venter (of human genome fame), have been working for several years to develop more efficient ways to harvest the oils that photosynthetic algae can produce. Traditionally, algae have been treated like a crop, to be grown and harvested. Co-products have been an integral part of the consideration in these traditional approaches. However, SGI is modifying genes to create new secretion pathways so that algae can continuously expel the oil they synthesize, making oil collection easier. Consequently, the process proposed by SGI is more like biomanufacturing than farming. Certainly, Exxon is experienced in continuous production processes, in the form of its oil and gas fields, refineries, and chemical plants.

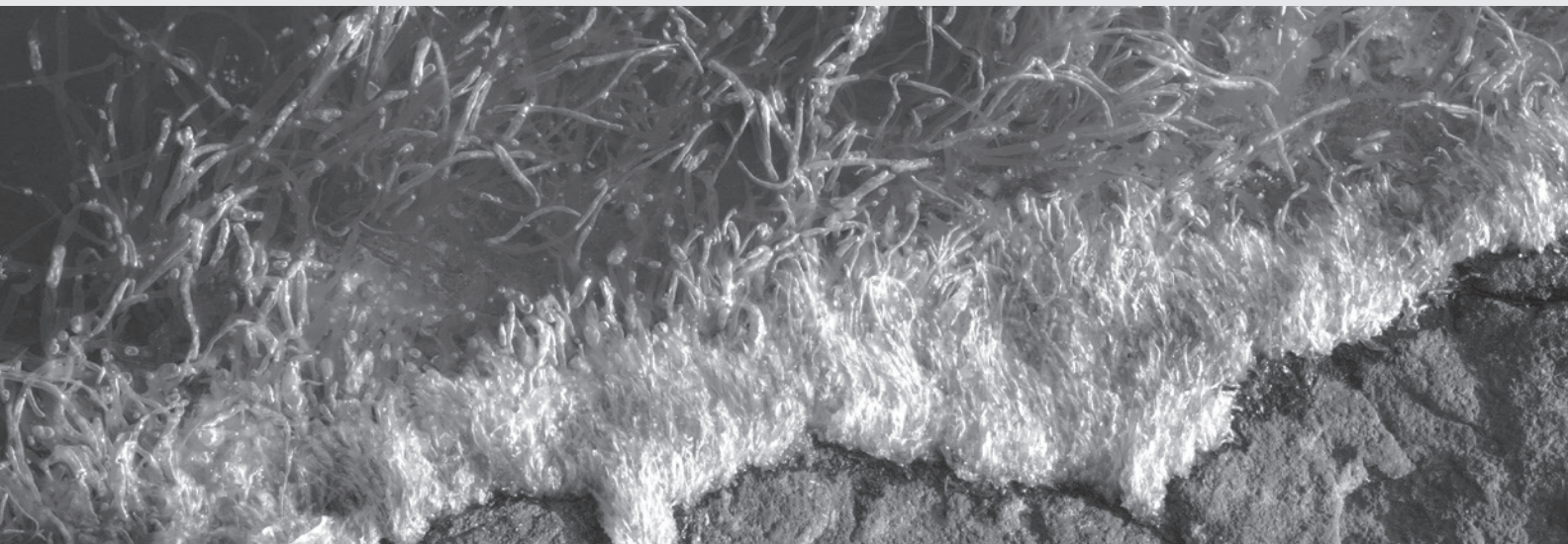
According to Economist.com (www.economist.com/sciencetechnology/displayStory.cfm?story_id=14029874), Exxon's money will help pay for the next step in SGI's R&D, to alter the biochemical pathways so that the algae make hydrocarbons, not triacylglycerols. The advantage to that is that the resultant hydrocarbons can be fed into the oil-refining process, on which ExxonMobil has considerable expertise, before the point at which gasoline and diesel are drawn off.

Additional modifications to the algal genome will be made to boost the yield beyond what nature would normally produce. The algae also must be engineered to resist virus attacks.

According to ExxonMobil's Jacobs, any large-scale commercial plants to produce algae-based fuels are at least 5 to 10 years away.

The majority of the research performed by SGI will take place in its facilities in La Jolla, California; SGI will build new greenhouse and test facilities, and hire a large number of new employees. EMRE will do its research primarily at its facilities in Clinton, New Jersey, and Fairfax, Virginia. Sites for scale-up activities will be determined later.

An expenditure of $600 million over five years is a relatively small number for Exxon, which earned $45.22 billion in 2008 (owing in part to record-high oil prices). However, if the two companies are on the right track, the future could lead to considerable rewards as the world seeks to lower greenhouse gas emissions (algae use CO_2 to grow) and create fuel replacements for dwindling supplies of petroleum. ■



18:785–788, 2007), presented a paper at the World Congress on Industrial Biotechnology and Bioprocessing on July 21 in which she reported that the organism has been developed to produce 70 grams of ethanol per liter (9% by volume) in a single-step process on an industrially pre-treated biomass feedstock. This yield exceeds the 50 g/L considered to be the threshold for commercial production of cellulosic ethanol.

These yields were obtained with a non-genetically engineered strain. The company expects additional improvements from efforts in molecular genetics and strain development.

Ethanol exports from Brazil decline

Ethanol exports from Brazil declined in value and volume in the first six months of 2009, according to an announcement by UNICA (the Brazilian Sugarcane Industry Association, União da Indústria de Cana-de-açúcar; São Paulo, Brazil) on July 21.

In 2008 Brazil exported 1.97 billion liters of ethanol, according to UNICA. The 2009 volume reached only 1.45 billion liters, a drop of more than 25%. The decrease in volume is similar to the decrease in US ethanol imports from Brazil, which were down from almost 500 million liters in the first half of 2008 to only 72 million liters this year.

UNICA said that so far the European Union (EU) and the countries that make up the Caribbean Basin Initiative are the leading importers of Brazilian ethanol. Together, the two regions accounted for more than 55% of Brazilian ethanol exports from January to June, with 412 million liters shipped to the EU and 400 million liters to the Caribbean.

GENERAL

Zoo animals may be key to new fuel

Researchers at Tulane University (New Orleans, Louisiana, USA) are developing biological methods to produce butanol, an alcohol that can be used in internal combustion engines. Project goals are to identify bacteria capable of producing a lot of biobutanol, then to modify them genetically to produce even more, from cellulose.

Butanol contains more energy per volume than ethanol, blends more readily with gasoline than ethanol, and can be distributed through existing pipelines, unlike ethanol.

More than a dozen strains of bacteria capable of fermenting butanol have been isolated from feces collected from plant-eating animals at New Orleans' Audubon Zoo. *The New Orleans City Business* newspaper quoted Eric Smith, associate director of the Tulane Energy Institute, as saying, "It sounds—and is—humorous . . . but these animals evolved an efficient way of consuming cellulose long before we thought of it." ■

To make biofuels, or not to make biofuels: That is the question.

Corn cobs, corn stover, and other crop residues are being developed as biofuel feedstocks.

Marguerite Torrey

In the past five years or so, opinion regarding the manufacture of biofuels has swung between approval and disapproval, and back again. First-generation fuels in particular, which are made from materials that can also serve as human or animal food, were initially praised, but then castigated. Biofuels have also been criticized as sources of greenhouse gas emissions. Second- and third-generation fuels are being explored with cautious optimism, but progress in generating fuels from biomass such as algae, forest materials, municipal wastes, and so on has been slow.

IDENTIFICATION OF ENVIRONMENTALLY SOUND FEEDSTOCKS

A recent article in *Science* (*325*:270–271, 2009) presents a consensus on the beneficial properties of biofuels reached by researchers from the University of Minnesota (Minneapolis, USA), Princeton University (New Jersey, USA), Massachusetts Institute of Technology (Cambridge, USA), and the University of California-Berkeley. The article results from a year of conversations and debate among some of the nation's leading biofuel experts, many of whom have been sharp critics of corn-based ethanol. In a nutshell, David Tilman, Robert Socolow, Jonathan A. Foley, Jason Hill, Eric Larson, Lee Lynd, Stephen Pacala, John Reilly, Tim Searchinger, Chris Somerville, and Robert Williams conclude, "Biofuels 'done right' have a bright future in solving our energy and environmental challenges."

To balance biofuel production, food security, and emissions reduction, the authors point out that the global biofuels industry must focus on five major sources of renewable biomass:

- Perennial plants grown on degraded lands abandoned from agricultural use
- Crop residues
- Sustainably harvested wood and forest residues
- Double crops and mixed cropping systems
- Municipal and industrial wastes

These sources can provide at least 500 million short tons per year of biofuel in the United States alone.

CROP RESIDUES AS BIOFUEL FEEDSTOCK

In a timely coincidence, the Springer-Verlag journal *Cellulose* devotes its August 2009 issue (*16*:531–762) to technological advances in the conversion of the residue from growing corn, or stover (i.e., cobs, stalks, and leaves remaining after corn grain is harvested), to biofuel. The 18 articles cover such topics as methods of treating stover to release fermentable substances, analysis of composition and sources of variability, the effect of delignification processes on cellulose digestibility, and the availability of stover for biomass conversion.

Richard Hess, Kevin L. Kenney, and Christopher T. Wright, of the Idaho National Laboratory (Idaho Falls, USA), and Robert Perlack and Anthony Turhollow, of Oak Ridge National Laboratory (Tennessee, USA), present an analysis of the costs involved in producing, harvesting, and collecting stover as well as the storing, handling and transportation, receiving, queuing, and preprocessing steps necessary for conversion to biofuels (*Cellulose 16*:599–619, 2009). They identify three barriers to the availability of corn stover for biorefining: (i) feedstock availability (Fig. 1), (ii) supply system logistics (i.e., the processes, capital, and operating costs associated with getting the stover resource from its production location to the in-feed system of the conversion process at the biorefinery), and (iii) characteristics of the biomass material itself.

Systems do exist to supply corn stover to biorefining facilities, but according to Hess and colleagues, present-day feedstock logistics systems are not well suited

FIG. 1. *Field trials of corncob harvesting carried out in Iowa on November 6, 2008, by POET LLC. Photograph courtesy of POET.*

to prepare stover physically for processing (e.g., densifying the materials to facilitate handling and storage, controlling water activity, and controlling oxidation and microbial degradation).

Hess and co-workers conclude that improvement in equipment efficiency, without technological change, will not allow cost performance goals to be achieved with the conventional corn supply system.

CORNCOBS FOR CELLULOSIC ETHANOL AND METHANE

POET LLC, formerly known as Broin Companies, has been among the leaders in the United States in the production of bioethanol from corn. More recently, the company, headquartered in Sioux Falls, South Dakota, also has been developing technologies for making ethanol from cellulosic materials, using corncobs as feedstock. At its pilot-scale plant in Scotland, South Dakota, POET can produce about 20,000 gallons (76,000 liters) of ethanol a year from the cobs supplied by 40 farmers living within about 20 miles (32 kilometers) of the plant. According to Matt Merritt of its Media Relations office, POET is currently concentrating its efforts entirely on cobs, but it may look at other feedstocks for cellulosic ethanol.

Not content with producing only cellulosic ethanol, POET recently installed an anaerobic digester at the Scotland plant to process liquid waste, resulting from breaking down corncobs, to produce methane, or natural gas. This will be burned at the plant to supply heat for various processes.

POET is spending $200 million at another of its facilities (Emmetsburg, Iowa, USA) to scale up its Scotland cellulosic-ethanol pilot plant. According to the Associated Press, POET expects to receive $100 million of that amount in federal and state aid to build the plant, called Project LIBERTY. The Emmetsburg plant is scheduled to come online in the fall of 2011 and produce 25 million gallons (94 million liters) of cellulosic ethanol annually.

Being able to sell corncobs for ethanol production will provide another revenue stream for corn farmers. POET spokesman Nathan Schock told the Associated Press on July 16 that the company has not yet figured out how much it will pay farmers, but it could be $30–$60 per short ton for corn stover. (In Iowa, an acre of corn yields about 1.5 short tons of corn stover, or 3.4 metric tons [MT] per hectare. Of that 1.5 short tons of stover per acre, corncobs constitute about 0.65 short tons/acre, according to POET [Fig. 2].)

FIG. 2. *Harvested and partially processed corncobs collected during field trials in Iowa on November 6, 2008. Photograph courtesy of POET LLC.*

Scott Weishaar, vice president of commercial development, said, "Agriculture equipment manufacturers are putting the final touches on a variety of harvesters that will be on the market soon." For all farmers and companies wanting to make ethanol from corncobs, questions still remain: Will the machines to pick up corncobs from the field cost more than the cobs bring in? Will farmers store the cobs until they are needed at the ethanol plant, or can they be stored onsite? And who is responsible for transporting the cobs, the farmer or the ethanol plant?

Partial answers to those questions exist: The US Department of Agriculture Farm Service Agency has a program called BCAP (Biomass Crop Assistance Program) that will provide matching funds of up to $45 per short ton for two years to help farmers defray those start-up costs. Initial assistance will be for the collection, harvest, storage, and transportation costs associated with the delivery of eligible materials. As for collection of corncobs, POET is asking farmers to pile them at the edge of their fields, where POET or one of its contractors will pick up the cobs.

POET has been testing prototype equipment for harvesting corncobs in fields. The photographs with this article were taken in Iowa in November 2008, and the company also ran tests near Harlingen, Texas, USA, during July 2009, as a lead-up to efforts to harvest 25,000 acres (10,000 hectares) in Iowa, South Dakota, and Texas later in the fall. The company website has several videos of prototypes of experimental corncob-harvesting equipment in action (www.projectliberty.com).

FINAL COMMENT

The wisdom of making first-generation biofuels from grains that can also be eaten by humans or animals has been widely questioned in the past few years. Other feedstocks, including corn stover in general and corncobs in particular, are a real possibility for the second- and third-generation manufacture of bioethanol. Much work remains to be accomplished, however, to make ethanol generated from crop residues, or wood and forest residues, commercially feasible.

---

inform *Technical Projects Editor Marguerite Torrey can be reached at mtorrey@aocs.org.*

C.M.Bernardini

Passion for Plants

seed extraction oils and fats refining

Seed preparation
Mechanical extraction
Solvent extraction

Neutralizing
Combined Neutralizing and winterizing
Bleaching,filtering
Deodorizing
Oil deacidification
Physical refining
Winterizing
Dry fractionation
Hidrogenation
Margarine and shortening
Batch refining

oleochemicals

Fats splitting
Fatty acids
Fatty acids fractional distillation
Detergent fractionation
Dry fractionation
Hidrogenation
Sweet water purification
Sweet water evaporation
Spent lyes purification
Spent lyes evaporation
Glycerine distillation and refining

biodiesel

Oil Pretreatment

Continuous transesterification

Glycerine pretreatment-refining

Methylester distillation and fractionation

C.M.BERNARDINI
Plants & Technologies for the Fats & Oils Industry

Via Appia Km 55.900
04012 Cisterna di Latina (Rome) Italy
Tel. +39 06 96871028 / Fax +39 06 9699793
E-Mail: info@cmbernardini.it
www.cmbernardini.it

Welcome New Members

AOCS Since 1909
Your Global Fats and Oils Connection

The AOCS is proud to welcome our newest members*.

*Joined from May 1, 2009 through July 31, 2009

Manish C. Agarwal, Petrochem Specialties
Mohammed Adul Hakeem Al-Saady, Intl Islamic University Malaysia
Emad S. M. Ameen, Intl Islamic University Malaysia
Paul Angers, Universite Laval
Fatma Nur Arslan, Karamanoglu Mehmetbey Universitesi
Cyril K. A. Asare, Reckitt Benckiser Arabia
Jean-Marie Aubry, ADRINORD
Spencer S. Awbrey
Ahmed S. Badawy, Cairo University
Avinash Bhadani, Guru Nanak Dev University
Norman J. Bishop, Oil-Dri Corp of America
Daniel W. Blake, Louis Dreyfus Agricultural Industries
Carlos H. Bueno, SIA Ltda
Clement Burnett, Seprod Ltd
Philip Calvi, Unity Scientific LLC
Sudip Chakraborty, University of Calabria ITM CNR
Prakash Chawla, Kamani Oil Industries
Sandeep Cherukuri, Northumbria University
Iftikhar Choudhry, Habib Oil Mills Pvt Ltd
Clorox Co.
Luciana Costa Leal, Inst de Celulosa y Papel
Ron J. Crook, POS Pilot Plant Corp
Hannah E. Cross, University of Huddersfield
Marvin Cummings, Seprod Ltd
Allen J. de Kock, Amafiltergroup
Elisabeth A. Dekkers, University of Florida
Arthur H. DJang, Sante International Inc
Brett Doney, Great Falls Development Authority
Keegan Duff, University of Idaho
Ioannis Falagas, Soya Hellas SA
Brantley M. Freeman, Algood Food Co
Anthony Galbo, American Specialty Oil Co
Luis Garay, Ragasa Industrias SA de CV
Tamalynn S. Gipson, Golden Peanut Co
Jhon Jairo Giron Alarcon, Universidad Santiago de Cali
Nicholas Goddard, Australian Oilseeds Federation
Mark Gogol, Amafiltergroup
Chun Yan Goh, University of Manitoba
Christina S. Griggs, Caravan Ingredients
Mohamed F. R. Hassanien, Zagazig University
Maan Hayyan, University of Malaya
Jonathan D. Heming, H B International
Jim Hetland, Karges-Faulconbridge Inc
Caley A. Hoediono, University of Guelph
Chia-Ping Hsu, Martek Bioscience Corp
Alice Hudson, Surface Chemists of Florida Inc
Hatice Iceli, Marsan Gida San Ve Tic AS
Jerome Jacobs, J Rettenmaier USA LP
Pramodkumar D. Jadhav, University of Saskatchewan
Jerry D. Jorden
Robert T. Kaminski, Wixon Inc
Abida Kausar, University of Sargodha
Yves Kegelaers, Puratos Group
Tae Yong Kim, Korea Feed Ingredients Assn
Myong K. Ko, RMI
Frantisek Kreps, Slovak Technical University
Marc L'Abbe, Proviron Industries NV
Danae S. Larsen, University of Auckland
Erik Lovaas, University of Tromso
Agustin Magallanes, ContiParaguay SA
Farrokh B. Malihi, Fargol Group
Elizabeth H. Malola, Rose-Hulman Inst of Technology
Lars Mansson, Danisco AS
Julie K. Mason, University of Toronto
Joe Mauriello, Biodis-Engineering-Swiss
Shyamchand Mayengbam, University of Manitoba
D. Julian McClements, University of Massachusetts
Barry McClernon, BioAlternative LLC
Sudhakar Y. Mhaskar, Marico Ltd
Yuka Mitsuhashi, Texas A&M University
Joe Mullinax, Denele Analytical Inc
Eekjoong Park, University of California
Pankaj Patial, Guru Nanak Dev University Amritsar
Ganesh S. Patil, Indian Institute of Technology
Anthony N. Pearce, Rose-Hulman Inst of Technology
Jerry Piekarski, Lipid Analytical Labs
Naga Ravikanth Putrevu, Illinois Institute of Technology
Rosidah Radzian, Malaysian Palm Oil Board
Cortes R. Ramon, Instituto Tecnologico de Tehuacan
W. M. Nimal Ratnayake, Health Canada
Shafeek Razac, BASF Corp
Rajesh J. Shah, Koehler Instrument Co
Fred Shih, USDA ARS SRRC
Mohammadreza Shokouhimehr, Kent State University
Anand Pal Singh, Parmalat Canada
Mark J. Stalboerger, Unity Scientific LLC
Karl D. Straub, Enscion
Xiuxhi (Susan) Sun, Kansas State University
Justine M. Tishinsky, University of Guelph
Christopher Turbeville, Bently Biofuels Co
Rashmi Tyagi
Patrick O. Ugho, Lagos State University
Sri Padma Vadrevu, Acharya NG Ranga Agricultural University
Nina van Heerden, Sime Darby Hudson & Knight
Bhalchandra P. Vibhute, Laxminarayn Institute of Technology
Ronald R. Watson, University of Arizona
Monica Whent, University of Maryland
Carol M. White, Archer Daniels Midland Co
Kirk C. Wiggins, Cavitation Technologies
John Wilson, T M Duche Nut Co Inc
Mark Wolverton, BASF Catalysts LLC
Okyar Yayalar, Edirne Yag Sanayi TAS
Hirosue Yoriyasu, J-Oil Mills Inc
Toshikazu Yoshikawa, Kyoto Prefectural University
Hua Yu, Akzo Nobel Chemicals Inc
Hamid Zamanian, Kesht Va Sanate Golbahare Sepahan

To become a member of the AOCS, complete, sign, and fax back the membership application in this issue or contact us.

AOCS
Barb Semeraro
Area Manager, Membership
Phone: +1-217-693-4804
E-mail: barbs@aocs.org
Website: www.aocs.org

Corporate memberships are available!
Call today and find out how your company can become a vital part of the AOCS network.

AOCS CORPORATE MEMBER

Briefs

A new method of assessing long-term dietary intake of *trans* fatty acids (TFA) has been suggested by researchers in India. Led by Lakshmy Ramakrishnan of the Centre for Chronic Disease Control in New Delhi, the scientists found that extraction of fatty acids (with special emphasis on TFA) from blood spotted and dried on filter paper is a viable method of analysis of dietary intake. The short communication appeared in *Nutrition Journal* (*8*:35, 2009).

■■■

The US government is funding a large trial of vitamin D and marine omega-3 fatty acids and heart disease and cancer. The study will involve 20,000 participants and will be led by researchers at Brigham and Women's Hospital (BWH) in Boston. The randomized, double-blind, placebo-controlled clinical trial will examine whether moderate to high doses of these supplements can help prevent colorectal, breast, prostate, and other cancers, as well as heart disease and stroke. According to BWH, the trial will "begin soon" and will run for five years.

■■■

The first study focusing on the preservation of antioxidant activity and content of total polyphenols, flavanol monomers, and procyanidins in heated or baked cocoa-containing products has been reported online in the *Journal of Food Science* (10.1111/j.1750-3841.2009.01226.x). Led by W.J. Hurst of the Hershey Co., the researchers show that the choice of leavening agents and the resultant effect on pH during baking is a key factor in the subsequent levels of antioxidant activity, total polyphenols, and flavanol compounds.

■■■

Raisio, the Finnish company that manufactures Benecol stanol ingredients and products, has funded two research projects aimed at determining the safety of high doses of stanols in humans. Both studies found that doses of up to 9 grams/day (g/d) given over four weeks in one study and 10 in the

CONTINUED ON NEXT PAGE

Health & Nutrition

Mixed results on DHA and memory

Two clinical studies on DHA supplementation and memory in humans were reported at the Alzheimer's Association 2009 International Conference on Alzheimer's Disease, held July 11–16 in Vienna. DHA (docosahexaenoic acid) is a long-chain omega-3 fatty acid (22:6) found in cold-water fish and algae. Previous animal studies and epidemiology in humans suggested that DHA may benefit persons with Alzheimer's.

One of the trials was conducted by the Alzheimer's Disease Cooperative Study (ADCS) and the other was performed by Martek Biosciences Corp. (Martek; Columbia, Maryland, USA), which manufactures algal DHA for supplementation. The ACDS trial lasted 18 months and was conducted in people with mild to moderate Alzheimer's. Martek's trial lasted six months, and the compound was tested in healthy people to see its effect on age-related cognitive decline. Both studies used Martek's algal DHA.

The results of the ADCS trial show no evidence for benefit in the studied population. The Martek trial showed a positive result on one test of memory and learning, but that study was in healthy older adults, not people with Alzheimer's or another dementia. Both results need confirmation.

"These two studies—and other recent Alzheimer's therapy trials—raise the possibility that treatments for Alzheimer's must be given very early in the disease for them to be truly effective," said William Thies, chief medical and scientific officer at the Alzheimer's Association. "For that to happen, we need to get much better at early detection and diagnosis of Alzheimer's, in order to test therapies at earlier stages of the disease and enable earlier intervention."

ALZHEIMER'S DISEASE COOPERATIVE STUDY

Researchers from the US National Institute on Aging -supported ADCS, led by Joseph Quinn, associate professor of neurology at Oregon Health and Sciences University, conducted a double-blind, randomized, placebo-controlled clinical trial comparing

other enhanced cholesterol reduction beyond what had been seen at 3 g/d in other studies. The research was presented in June 2009 at the 15th International Symposium on Atherosclerosis in Boston, Massachusetts, and is in the process of being peer-viewed, according to NutraIngredients-usa.com. Raisio is analyzing the results to determine the optimum dosage level for cholesterol reduction, the website said.

■■■

Mice fed a diet high in sunflower oil improved their running abilities by about 6%, according to a report by scientists at the Research Institute of Wildlife Ecology in Austria at the Society for Experimental Biology Annual Meeting in late June. The researchers attribute their finding to omega-6 polyunsaturated fatty acids present in sunflower oil. They said that the mice fed for two weeks on a diet high in sunflower oil ran on average 0.19 m/s faster than mice fed a diet rich in flax oil, which is high in -linolenic acid, an omega-3 fatty acid.

■■■

A study in mice suggests that acetic acid (vinegar) may prevent the buildup of fat, and therefore weight gain. Japanese researchers, led by Tomoo Kondo from the Central Research Institute of the Mizkan Group Corp., found that vinegar apparently worked at a genetic level by influencing genes linked to fatty acid oxidation and energy-burning proteins. In the study, mice fed a high-fat diet supplemented with acetic acid developed about 10% less body fat than mice eating only the diet. The study appeared in the *Journal of Agricultural and Food Chemistry* (*57*:5982–5986, 2009). ■

DHA and placebo in 402 people (average age = 76) diagnosed with mild to moderate Alzheimer's at 51 sites in the United States.

At the beginning of the trial, all participants had a dietary DHA intake of less than 200 milligrams/day. Subjects were treated with DHA or placebo at a dose of two grams/day for 18 months. Those participants already taking approved Alzheimer's drugs could continue taking them during the trial. Co-primary outcomes were rate of change on the Alzheimer's disease assessment scale-cognitive (ADAS-cog) and rate of change on the Clinical Dementia Scale-sum of the boxes. These two measures are the current standard tests used by US Food and Drug Administration when assessing new Alzheimer's drugs.

According to the researchers, treatment with DHA clearly increased blood levels of DHA, and also appeared to increase brain DHA levels, based on a measured increase of DHA in study participants' cerebrospinal fluid. However, DHA treatment did not slow the rate of change on tests of mental function (ADAS-cog), global dementia severity status, activities of daily living, or behavioral symptoms in the study population as a whole. There was no different treatment effect between the mild and moderate Alzheimer's patients.

"These trial results do not support the routine use of DHA for patients with Alzheimer's," Quinn said.

In a pre-planned exploratory data analysis, study participants were divided according to whether they carried the "e4" version of the ApoE (Apolipoprotein E) gene. ApoE-e4 increases the risk of developing Alzheimer's but does not appear to modify the rate of disease progression. In the subjects who had an ApoE-e4 gene, the researchers found no benefits of DHA treatment. In contrast, those without the ApoE-e4 gene who received DHA had a slower rate of decline on the primary test of mental function (the ADAS-cog). A trend in the same direction was seen on the Mini-mental state examination, another test of mental function.

"This is an intriguing exploratory result," said Quinn. "However it must be treated with appropriate caution. The finding requires further study for confirmation.

"One of the issues raised by this study—and other recent Alzheimer's and mild cognitive impairment therapy trials—concerns a possible interaction between certain therapies and genetic status. This issue needs to be explored more completely in future trials," Thies added.

MEMORY IMPROVEMENT WITH DHA STUDY

Researchers at Martek Biosciences Corp. examined the effects of algal DHA as a possible neuroprotective nutritional supplement for age-related cognitive decline in their Memory Improvement with DHA Study.

Scientists led by Karin Yurko-Mauro, associate director of clinical research at Martek, conducted a randomized, double-blind, placebo-controlled, multi-center, six-month study to determine the effects of 900 milligrams/day of algal DHA on improving cognitive functions in 485 healthy older people (average age = 70) with mild memory complaint. The primary outcome measure was a change from baseline in CANTAB Paired Associate Learning (PAL), a visuospatial episodic memory test.

After six months, the researchers found that the study participants taking DHA supplements made significantly fewer errors on the PAL compared to when they started the study (-1.63 ± 0.76, $p < 0.03$). Plasma phospholipid DHA levels doubled over the course of the study in those subjects taking the supplements, and correlated with the PAL response ($p < 0.04$).

The scientists also observed a significant decrease in heart rate in those taking DHA (change from baseline of -3.2 vs. -1 BPM, $p < 0.03$) that was highly correlated with week 24 plasma levels ($p<0.01$). Blood pressure and body weight remained unchanged between groups. Plasma levels of Alzheimer's-related proteins amyloid β 1-40, 1-42, and hs-CRP were not significantly different.

The researchers observed no treatment-related serious adverse effects in the study, and the adverse effects profile for DHA was the same as for the placebo.

"In our study, healthy people with memory complaints who took algal DHA capsules for six months had almost double the reduction in errors on a test that measures learning and memory performance versus those who took a placebo," Yurko-Mauro said. "The benefit is roughly equivalent to having the learning and memory skills of someone three years younger."

In related news, an epidemiological study of 15,000 persons aged 65 and older in China, India, Cuba, Venezuela,

Mexico, Peru, and the Dominican Republic, found that those who ate fish nearly every day were almost 20% less likely to develop dementia than those who ate fish just a few days a week. Adults who ate fish a few days a week were almost 20% less likely to develop dementia than those who ate no fish at all. The study appeared in the *American Journal of Clinical Nutrition* (*90*: 392–400, 2009).

Olives, not fish, key to longevity?

Fruits, vegetables, nuts, legumes, olive oil, and moderate consumption of alcohol, are more closely linked to longevity than fish, seafood, and cereals, according to researchers led by Dimitrios Trichopoulos of the Harvard School of Public Health in Boston (USA). According to Trichopoulos and colleagues, theirs is the first effort to determine the relative importance of individual dietary components in the link between the so-called Mediterranean diet and all-cause mortality.

Results were based on 23,349 healthy men and women followed for around 8.5 years. Overall, higher adherence to a typical Mediterranean diet was linked to a significantly lower risk of death from all causes. Risk was reduced by about 14% among those keeping to the diet, which includes lower intakes of red meat and dairy.

The researchers conclude: "The dominant components of the Mediterranean diet score as a predictor of lower mortality are moderate consumption of ethanol, low consumption of meat and meat products, and high consumption of vegetables, fruits and nuts, olive oil, and legumes. Minimal contributions were found for cereals and dairy products, possibly because they are heterogeneous categories of foods with differential health effects, and for fish and seafood, the intake of which is low in this population."

The study appeared online ahead of print in the *British Medical Journal* (BMJ 2009;338:b2337). It was funded by the Europe against Cancer Program of the European Commission and the Greek Ministries of Health and Education.

Caloric restriction in monkeys

A 20-year study on rhesus monkeys is the latest to suggest that substantially reducing caloric intake slows the aging process and leads to longer life spans in primates (*Science 325*:201–203, 2009).

Previous studies with yeast, worms, flies, and rodents have suggested that this kind of caloric restriction—a reduction of about 30% and very different from malnutrition—can lead to such health benefits in some mammals, but given the many parallels between rhesus monkeys and humans, this study suggests that these benefits might occur in humans as well.

Ricki Colman of the University of Wisconsin (Madison, USA) and colleagues began their study at the Wisconsin National Primate Research Center in 1989 by assigning adult rhesus monkeys, each between ages seven and 14, to either a caloric restriction group or a control group. Once the monkeys were assigned to a group, the researchers determined their baseline food intake and began reducing the diets of those monkeys in the caloric restriction, or CR, group by 10% for three months until they reached the desired 30% restriction. At the end of the study, 37% of the control group had died of age-related causes whereas only 13% of the CR group had. This finding means that the control monkeys experienced a death rate from age-related conditions such as diabetes, cancer, cardiovascular disease, and brain atrophy three times that of the CR group. Any monkey that died over the course of the study underwent a complete necropsy by a board-certified pathologist so that age-related deaths could be distinguished from other unrelated conditions.

These results indicate that caloric restriction in adulthood can delay the onset of age-associated pathologies in this species of rhesus monkeys.

Cottonseed oil and vitamin E

A new pilot study suggests cottonseed oil consumption significantly increases vitamin E intake without affecting fat intake, according to nutrition researchers at Texas Woman's University in Houston, Texas, USA.

The research team, led by John Radcliffe, studied 10 healthy adult subjects (six female and four male), recording their regular diets for two weeks to establish a baseline for comparison. The subjects were then asked to consume two cottonseed oil-rich foods (one muffin per day made with commercially available cottonseed oil, and four servings of potato chips per week, fried only in cottonseed oil) for four weeks. The food products provided about one tablespoon of cottonseed oil per day, or 33% of the Recommended Dietary Allowance (RDA) of vitamin E. The subjects' consumption of vitamin E previous to the study was just 53% of the RDA.

The increased cottonseed oil consumption apparently did not impact fat intake. The researchers believe the cottonseed oil-rich foods naturally displaced other foods in the subject's diets. ■

2009

AOCS Since 1909
Your Global Fats and Oils Connection

MEMBERSHIP APPLICATION

09INF

Street Address: 2710 S. Boulder Drive, Urbana, IL 61802-6996 USA.
Mail Address: P.O. Box 17190, Urbana, IL 61803-7190 USA.
Phone: +1-217-359-2344; **Fax:** +1-217-351-8091; **E-Mail:** membership@aocs.org; **Web:** www.aocs.org

Please print or type. All applicants must sign the Code of Ethics.

❑ Dr. ❑ Mr. ❑ Ms. ❑ Mrs. ❑ Prof.

Last Name/Family Name _____ First Name _____ Middle Initial _____

Firm/Institution _____

Position/Title _____

Business Address (Number, Street) _____

City, State/Province _____

Postal Code, Country _____ Year of Birth (optional) _____

Business Phone _____ Fax _____ Previously an AOCS student member? ❑ Yes ❑ No

E-mail _____ Expected Graduation Date _____

Invited to be a member by _____

MEMBERSHIP DUES

$ _____

	U.S./Non-U.S. Surface Mail	Non-U.S. Airmail
❑ Active	❑ ~~$148~~ **$99**	❑ ~~$233~~ **$184**
❑ Corporate	❑ $750	❑ $750
❑ Student*	❑ $ 0	❑ N/A

Membership dues include a monthly subscription to* inform. *Active membership is "individual" and is not transferable. Membership year is from January 1 through December 31, 2009.

*Complimentary student membership includes free access to online *inform* only. Student membership applies to full-time graduate students working no more than 50% time in professional work, excluding academic assistantships/fellowships. A professor must confirm these conditions every year, in writing.

OPTIONAL TECHNICAL PUBLICATIONS

$ _____

JAOCS	❑ $150
Lipids	❑ $150
Journal of Surfactants and Detergents	❑ $150

These prices apply only with membership and include print and online versions and shipping/handling.

inform—**Student member only, rate for print**

U.S./Non-U.S. Surface Mail	Non-U.S. Airmail
❑ $30	❑ $115

DIVISIONS AND SECTIONS DUES (Students may choose one free Division membership.)

$ _____

Divisions	Dues/Year	Divisions	Dues/Year	Sections	Dues/Year	Sections	Dues/Year
❑ Agricultural Microscopy	$12	❑ Industrial Oil Products	$15	❑ Asian	FREE	❑ India	$10
❑ Analytical	$15	❑ Lipid Oxidation and Quality	$10	❑ Australasian	$25	❑ Latin American	$15
❑ Biotechnology	$10	❑ Phospholipid	$20	❑ Canadian	$15	❑ USA	FREE
❑ Edible Applications	$15	❑ Processing	$10	❑ European	$10		
❑ Food Structure and Functionality	$20	❑ Protein and Co-Products	$10				
❑ Health and Nutrition	$15	❑ Surfactants and Detergents	$20				

MEMBERSHIP PRODUCTS

❑ Membership Certificate: $25 • ❑ AOCS Lapel Pin: $10 • ❑ Membership Certificate and AOCS Lapel Pin: $30 $ _____

PREFERRED METHOD OF PAYMENT

❑ Check or money order is enclosed, payable to the AOCS in U.S. funds drawn on a U.S. bank.
❑ Send bank transfers to: Busey Bank, 201 West Main Street, Urbana, Illinois 61801 USA. Account number 111150-836-1. Reference: Membership. Routing number 071102568. Fax bank transfer details and application to the AOCS.
❑ Send an invoice for payment. (Memberships are not active until payment is received.)
❑ I wish to pay by credit card: ❑ MasterCard ❑ Visa ❑ American Express ❑ Discover

TOTAL REMITTANCE
$ _____

Credit Card Account Number _____ Name as Printed on Card _____

Expiration Date _____ Signature _____

Dues are not deductible for charitable contributions for income tax purposes; however, dues may be considered ordinary and necessary business expenses.

AOCS: Your international forum for fats, oils, proteins, surfactants, and detergents.
This Code has been adopted by the AOCS to define the rules of professional conduct for its members. As a condition of membership, it shall be signed by each applicant.

AOCS Code of Ethics • Chemistry and its application by scientists, engineers, and technologists have for their prime objective the advancement of science and benefit of mankind. Accordingly, the Society expects each member: 1) to be familiar with the purpose and objectives of the Society as expressed in its Articles of Incorporation; to promote its aim actively; and to strive for self-improvement in said member's profession; 2) to present conduct that at all times reflects dignity upon the profession of chemistry and engineering; 3) to use every honorable means to elevate the standards of the profession and extend its sphere of usefulness; 4) to keep inviolate any confidence that may be entrusted to said member in such member's professional capacity; 5) to refuse participation in questionable enterprises and to refuse to engage in any occupation that is contrary to law or the public welfare; 6) to guard against unwarranted insinuations that reflect upon the character or integrity of other chemists and engineers.

I hereby subscribe to the above Code of Ethics. Signature of Applicant _____

Biotechnology News

Briefs

A team of scientists has modified specific Na^+ transport processes in specific cell types of *Arabidopsis thaliana* to produce reduced shoot accumulation of Na^+, an important component of salt tolerance in many higher plants. The research team—based at the University of Adelaide's Waite Campus in Australia and headed by Mark Tester (School of Agriculture, Food, and Wine at the University of Adelaide and the Australian Centre for Plant Functional Genomics)—announced in July that it had used a new genetic modification technique to keep salt—as sodium ions (Na^+)—out of the leaves of *A. thaliana*. The researchers modified genes specifically around the plant's water-conducting vessels (xylem) so that salt is removed from the transpiration stream before it gets to the shoot.

"This reduces the amount of toxic Na^+ building up in the shoot and so increases the plant's tolerance to salinity," Tester said. "In doing this, we've enhanced a process used naturally by plants to minimize the movement of Na^+ to the shoot. We've used genetic modification to amplify the process, helping plants to do what they already do—but to do it much better."

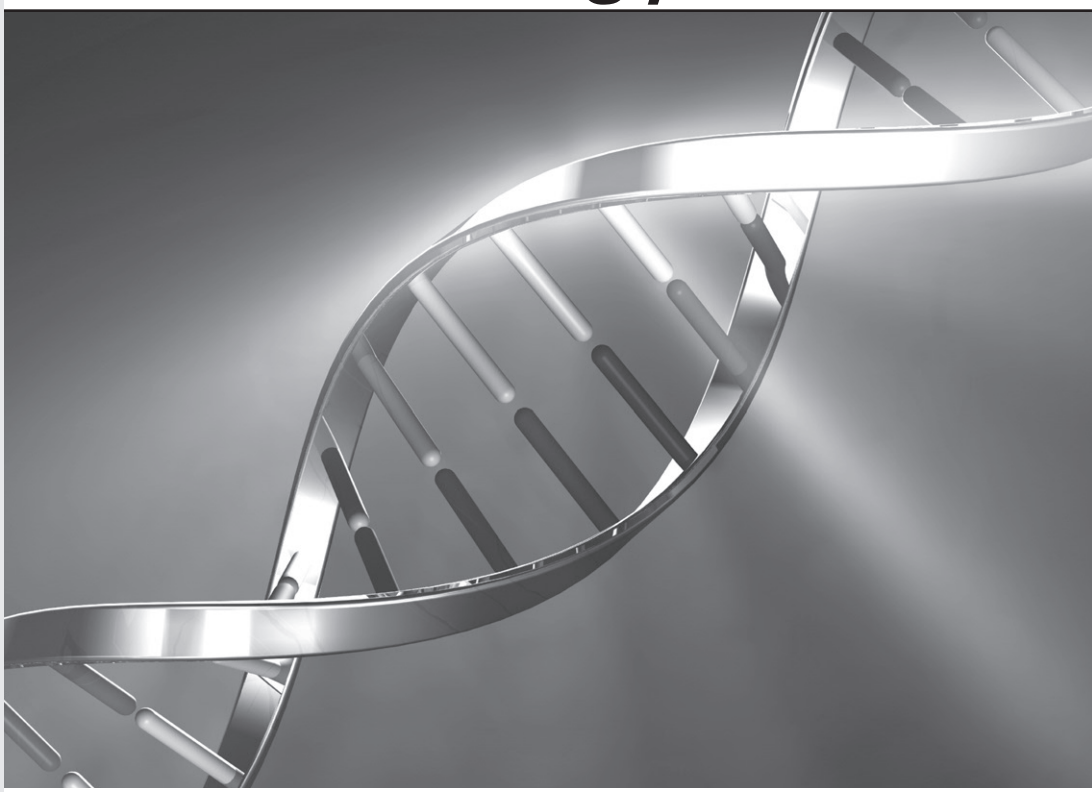
The results of their work were published in *The Plant Cell* (doi: 10.1105/tpc.108.064568).

■■■

Syngenta (Wilmington, Delaware, USA) announced in August the signing of an agreement to acquire from Monsanto Co. (St. Louis, Missouri, USA) its global hybrid sunflowerseed activities for a consideration of $160 million, on a cash and debt-free basis. The asset deal includes germplasm, development, and breeding of hybrid sunflowerseeds. In 2008, Syngenta's sunflowerseeds business had sales of more than $200 million.

In related company news, Syngenta Biotechnology Inc. announced in July that it had entered into a collaboration agreement with Evogene Ltd. (Rehovot, Israel), focusing on

CONTINUED ON NEXT PAGE



Turning bacteria into biotech factories

High-throughput sequencing has turned biologists into voracious genome readers, enabling them to scan millions of DNA letters, or bases, per hour. When revising a genome, however, they struggle; labs get bogged down with particular DNA sentences, tinkering at times with subsections of a single gene before moving along to the next one. A team of researchers believe they have overcome this obstacle by developing a new cell programming method called Multiplex Automated Genome Engineering (MAGE).

Led by a pair of researchers in the lab of George Church, Harvard Medical School (Boston, Massachusetts, USA) professor of genetics, the team refined the design of a bacterium by editing multiple genes in parallel instead of targeting one gene at a time. They transformed *Escherichia coli* cells into efficient factories that produce a desired compound, accomplishing in just three days a feat that would take most biotech companies months or years. The research was published in *Nature* (*460*:894–898, 2009).

"We initiated the project to close the gap between DNA sequencing technology and cell programming technology," explains graduate student Harris Wang, the paper's co-first author.

"The goal was to use information gleaned from genetics and genomics to rapidly engineer new functions and improve existing functions in cells," adds postdoctoral researcher Farren Isaacs, the other first author. "We wanted to develop a new tool and demonstrate how to apply it; we were determined to hand labs a hammer and a nail."

The key was to break free of linear genetic engineering techniques and move beyond the serial manipulation of single genes.

The researchers selected a harmless strain of *E. coli* and added a few genes to its solitary circular chromosome, coaxing the organism to produce lycopene, an antioxidant that occurs naturally in tomatoes and other vegetables. Now they could focus on tweaking the cells to increase the yield of this compound.

Traditionally, labs would accomplish this type of transformation by using

identifying plant genes related to soybean nematode resistance. Under the agreement, Syngenta will receive exclusive licensing rights to candidate genes discovered by Evogene for use in soybean.

■■■

Monsanto Co. and Dow AgroSciences LLC (Indianapolis, Indiana, USA) announced in July that SmartStax™, an all-in-one corn trait platform, received registration from the US Environmental Protection Agency (EPA) and regulatory authorization from the Canadian Food Inspection Agency (CFIA). The companies, who signed a cross-licensing agreement and research and development collaboration in 2007, said that these authorizations keep SmartStax on track for a 2010 commercial launch.

SmartStax combines each company's corn traits to provide: (i) above-ground insect control for protection against corn earworm, European corn borer, southwestern corn borer, sugar cane borer, fall armyworm, western bean cutworm, and black cutworm; (ii) below-ground insect control for protection against western, northern, and Mexican corn rootworms; and (iii) broad spectrum weed and grass control.

In August the two companies announced that they had received full Japanese regulatory approval for importation of grain produced from SmartStax.

■■■

TwistDx (Cambridge, United Kingdom), a developer of point-of-use nucleic acid diagnostics, announced in August that they are developing rapid, DNA-based field tests with Monsanto, designed "to accurately and rapidly identify biotech products in field settings." To develop the tests, the companies are using TwistDx's proprietary Recombinase Polymerase Amplification (RPA) technology. RPA is a novel DNA amplification technology that enables the tests to produce results faster than other DNA detection tests currently available, while maintaining a high level of specificity and sensitivity.

■■■

CONTINUED ON NEXT PAGE

recombinant DNA technology, also known as gene cloning, a complicated technique that involves isolating, breaking up, reassembling, and then reinserting genes.

The Church lab researchers took a different approach, blending an engineer's logic with a biologist's appreciation for complexity. "Genes function in teams, not in isolation," says Wang. "Cloning often encourages us to ignore the interdependence of genes and oversimplify the cellular system. We might forget, for example, that one mutation can strengthen or weaken the effects of another mutation."

The *E. coli* bacterium contains approximately 4,500 genes. The team focused on 24 of these—honing a pathway with tremendous potential—to increase production of the antioxidant, optimizing the sequences simultaneously. They took the 24 DNA sequences, divided them up into manageable 90-letter segments, and modified each, generating a suite of genetic variants. Next, armed with specific sequences, the team enlisted a company to manufacture thousands of unique constructs. The team was then able to insert these new genetic constructs back into the cells, allowing the natural cellular machinery to absorb this revised genetic material.

"We accelerated evolution, generating as many as 15 billion genetic variants in three days and increasing the yield of lycopene by 500%," Harris says. "Can you imagine how long it would take to generate 15 billion genetic variants with traditional cloning techniques? It would take years."

Report examines biotech in Egypt

The US Department of Agriculture's Foreign Agricultural Service recently released a report (GAIN Report No. EG9012) offering an overview of the development and adoption of biotech products in Egypt.

A LEADER IN THE REGION

Egypt consumes large quantities of biotech products such as corn and soybeans. Although it has not produced any commercial biotechnology crops, Egypt leads the Middle East and North Africa region in the development and acceptance of agricultural biotechnology. The Ministry of Agriculture is a strong supporter of biotechnology. Egypt is a large consumer of agricultural products (such as corn, soybeans, soy meal, and vegetable oils) derived through modern biotechnology and imported from the United States and Argentina. The government continues to maintain a general import policy that allows imports so long as the product imported is also consumed in the countries of origin. Through collaboration with Monsanto, the Cotton Research Institute (CRI) has developed an insect-resistant long-staple genetically modified (GM) cotton strain, which is considered the number one crop for commercialization.

RESEARCH

To date, Egypt has not produced any commercial biotechnology crops. Research is being conducted on a number of crops, including:

Yellow varieties of maize, modified for resistance to borers, applying technology produced by two international companies (Monsanto and Pioneer). Egypt's Agricultural Genetic Engineering Research Institute (AGERI) had no gene to work with, and thus *Bt* maize was imported into the country by the private sector, for use in field trials. Monsanto—through a local company—planted a GM variety called Ageeb yellow grain (yg), which is GM corn with MON 810 to resist corn borers.

The GM corn has already been planted in four sites (Sids in Kafr El-Sheikh, Nubaria [new reclaimed lands], army farm at Cairo-Alexandria desert road, and El-Gharbia governorate).

In 2008, Ageeb yg was the first GM crop to be commercialized in the country. The Egyptian government allowed the importation of about 28 tons of the transgenic corn seeds in to the Egyptian market for the purpose of the use as silage, but in 2009, the NBC (National Biosafety Committee) stopped importation of any more transgenic corn seeds from outside the country (mainly South Africa) with the intention of completing a biosafety framework in the country.

Cotton. This new cotton crop contains a patented gene purchased from Monsanto that makes the plants resistant to certain insects, but it retains its unique Egyptian characteristics in every other respect. The new plants produce the sought-after long-staple fibers for which Egyptian cotton is known. Field trials of the new long-staple cotton varieties (namely, Giza 86, 89, 90,

91, 96) were cultivated under the supervision of AGERI. Twenty-two kilograms of cottonseeds were planted in two areas: Bani Suief and El-Gemaiza.

Researchers develop process that enables "surgical" genetic changes

Research led by scientists at Iowa State University's (Ames, USA) Plant Sciences Institute has resulted in a process that will make genetic changes in plant genes much more efficient, practical, and safe. Announced in July, the breakthrough was developed by David Wright, an associate scientist, and Jeffery Townsend, an assistant scientist, and allows targeted genetic manipulations in plant DNA, which could have a significant impact on plant genetic work in the future.

Until now, when scientists introduced DNA into plants, they would randomly inject that DNA into the plant cell. There was no way of knowing if it was in the right place or if it would work until many resulting plants were tested. The new technique harnesses a natural process called homologous recombination to precisely introduce DNA at a predetermined location in the plant genome through targeted DNA breaks generated by zinc finger nucleases. This occurs in about 1 in 50 attempts and is very efficient compared with unassisted methods that allow the same changes at a rate as low as 1 in 10 million.

"I've been working in this field for 29 years, just when we started learning how to modify genes," said Townsend. "From that day, this was the goal—to actually get the research to the point where you can have homologous recombination. Now, we've done it."

In using this process, a specific gene is located in a living cell, then a break is made in the DNA of that gene. When the cell begins to heal itself, existing DNA can be deleted or modified, or new DNA can be added near the break site. Afterward, the cell carries the genetic change and passes the change on to its offspring.

"It's like surgery, only on the molecular level," said Wright.

Discovering DNA variation in crop genomes

The study of human genetics has been a successful venture for researchers in recent years. Several million single-nucleotide polymorphisms (SNP) have been identified from the whole-genome resequencing of multiple individuals, which have served as genetic markers to pinpoint genes controlling common human diseases. In contrast, the genome of a single cultivar or line has yet to be sequenced in its entirety for most crops of economic or societal importance. This slow pace of genomic progress can be mostly explained by the high costs and technical difficulties associated with sequencing crop genomes, which tend to be large in size and complex—containing a high amount of repetitive DNA and duplicated genes that are highly similar in sequence.

With the advent of high-throughput DNA sequencing technologies, it is now possible to cheaply and rapidly sequence hundreds of millions of bases in a matter of hours. A team of scientists at Cornell University (Ithaca, New York, USA), the US Department of Agriculture-Agricultural Research Service (USDA-ARS), Cold Spring Harbor Laboratory (Cold Spring Harbor, New York), Roche Applied Science Corp. (Indianapolis, Indiana) and 454 Life Sciences (Branford, Connecticut) have developed molecular and computational tools for the efficient and accurate identification of gene-enriched SNP in crops. The large, complex genome of maize was used to evaluate these tools.

The study was funded by the National Science Foundation (NSF), Roche Applied Science Corp., and the USDA-ARS. Results from the study were published in *The Plant Genome* (*2*:121–133, 2009).

In this research collaboration, an existing molecular technique was modified to enable gene-enrichment and resequencing of maize inbred lines B73 and Mo17 with massively parallel pyrosequencing. In addition, a custom computational pipeline was developed to analyze and assemble short reads and identify correctly mapped reads. With the implementation of these methods, the authors identified 126,683 gene-enriched SNP between B73 and Mo17 at high accuracy.

"Next-generation sequencing technologies will greatly accelerate the resequencing of multiple to numerous individuals for every major crop species," says Michael Gore, first co-author of the study. "Such efforts will facilitate the construction of SNP datasets on the order of millions that can be used in whole-genome association studies to assess the contribution of SNP—common or rare—to complex traits. What we have learned from this pilot study will help us to construct a community SNP resource in maize that is comparable in scale to that of the human haplotype map." ■

The National Research Council of Canada (Ottawa, Ontario) and the Centre for BioSystems Genomics (CBSG; Wageningen, Netherlands) have signed a cooperation agreement in the field of *Brassica* and *Arabidopsis* (thale cress) genomics research. The consortium will jointly study the genetics of lipid metabolism in plants. Lipids are a valuable raw material for both food and nonfood industries. The second focus of the cooperation is the dissection of the genetic basis of seed quality and vigor—traits with great agricultural impact. The third research topic aims to identify the signaling pathways that are involved in the formation of haploid embryos. Better understanding and use of this process will help plant breeders to improve their breeding process. This initiative further broadens CBSG's aim to establish additional internationalization activities.

■■■

In late July, Bayer CropScience (Monheim am Rhein, Germany) inaugurated a new center of innovation northeast of Saskatoon, Saskatchewan, Canada, dedicated to the research, development, and breeding of canola/oilseed. The new center is an addition to Bayer's existing 225-hectare breeding station. The facility will employ approximately 40 people, including plant breeders, molecular scientists, and plant pathologists. It brings the Bayer CropScience canola breeding program together in one facility for the first time. ■

S&D News

Briefs

The Procter & Gamble Co. (P&G; Cincinnati, Ohio, USA) is testing a lower-priced (by 20%) version of its popular Tide laundry detergent in 100 retail outlets in the southern United States, according to *Datamonitor NewsWire*. The test of Tide Basic "is aimed at households that have not been using Tide, apart from the existing customers who want a lower price," the report noted.

■■■

Henkel Romania recently introduced its Pur Hands & Nails + Calcium dishwashing liquid in Romania. The soap contains calcium pantothenate that, although frequently used in cosmetic products to strengthen nails, is a novel ingredient for a dishwashing product, Henkel said in a written statement.

■■■

Adco Cleaning Products LLC (Sedalia, Missouri, USA) is offering a line of "ecologically friendly" home laundry products that are being sold directly to consumers by dry cleaners. The line, named AdcoEco, includes a biodegradable concentrated liquid detergent and fabric softener.

■■■

Dow Chemical Co. (Midland, Michigan, USA) announced in July that it was shutting down two units at its Hahnville, Louisiana (USA) facility—an ethylene cracker and an ethylene oxide-ethylene glycol unit—because of a glut in the plastics market.

■■■

VASKA, a manufacturer of botanically-based laundry care products for the commercial, institutional, and consumer markets, says it has "successfully turned the first major commercial laundry plant in the United States (and possibly the world) 'green.'" Royal Laundry of South San Francisco is the largest privately owned commercial laundry on the West Coast, according to VASKA, washing one million pounds of laundry a week for more than 100 Northern California hotels. In July, Royal began using VASKA's "herbatergent," which was given the US Envi-

CONTINUED ON PAGE 592

F3 factory debuts

Chemical companies and research institutions in Europe have introduced a project to develop a new approach to manufacturing chemicals that will reduce raw material and production costs.

The F3 (flexible, fast, and future) Factory initiative involves 25 partners who will work to reduce industry costs by about E3.75 billion a year. The consortium aims to design and develop a modular continuous plant, to standardize processes and their interfaces, and also to demonstrate the capabilities of the F3 Factory with existing products. The partners also aim to apply the efficiency and scalability of world-scale continuous plants to batch production facilities.

Another goal is to develop products such as solvent-free polymers, customized surfactants, high value-added building blocks and intermediates for pharmaceuticals, and innovative materials based on renewable materials. A demonstration and development center will be constructed by early 2011 at Bayer's headquarters in Leverkusen , Germany.

The F3 Factory consortium includes Arkema, AstraZeneca, BASF, Bayer Technology Services, Britest, Buss-SMS-Canzler, Centre National de la Recherche Scientifique CNRS, Coatex, Technical University of Denmark, Ehrfeld Mikrotechnik BTS, Institut National Polytechnique de Lorraine–ENSIC, Evonik Degussa, Forschungszentrum Karlsruhe, Institute of Catalysis & Surface Chemistry PAS, Institute of Chemical Process Fundamentals, KTH Royal Institute of Technology, Process Design Center, Rhodia, RWTH Aachen University, Technische Universitat Dortmund, Eindhoven University of Technology, University of Newcastle, University of Paderborn, Procter & Gamble, and Ruhr-University Bochum.

Product labeling legislation

US Representative Steve Israel (D-Long Island, New York), the Citizens Campaign for the Environment, and the Huntington Breast Cancer Action Coalition are working on product labeling legislation:

The Household Product Labeling Act of 2009 (HR 3057) was introduced by Rep. Israel in July 2009.

Current federal law does not require companies to list ingredients for household products including cleaning agents, pesticides, epoxy, paint, and stains. Rep. Israel's legislation would require that companies provide a complete and accurate list of all ingredients on the product container or product packaging.

BASF restructuring

BASF announced its plans for the integration of Ciba Holding AG of Basel, Switzerland, which it acquired in April 2009. BASF said it will integrate former Ciba businesses into the operating divisions in BASF's Performance Products segment. BASF is based in Ludwigshafen, Germany.

The restructuring plans include a reduction of approximately 3,700 positions by 2013, the majority of which will be eliminated by the end of 2010. BASF may restructure, sell, or close 23 of the 55 former Ciba production sites worldwide. Decisions will be made about these sites by the end of the first quarter of 2010. The remaining 32 production sites "are to be optimized as part of BASF's global production network or restructured," the company said. By the end of 2010, BASF also aims to consolidate 36 of the former Ciba's 70 sales and administrative offices and research sites with existing BASF activities.

BASF announced that:

- Ciba's Home & Personal Care business will be integrated into the existing structure of the Care Chemicals division.
- Ciba's and BASF's paper businesses will be bundled and restructured within the newly formed Paper Chemicals division.
- All Ciba's coatings effects activities will be integrated into BASF's Dispersions & Pigments division, which is organized in regional business units. BASF will become the world's second-largest provider of raw materials for the coatings and paints industry after the integration, the company said.
- Ciba's plastic additives business will be integrated into the Performance Chemicals division.
- The majority of Ciba's water treatment business will be integrated into the Performance Chemicals division. A strategy for the water treatment business will be developed by 2010.

In other company news, BASF-YPC has received approval from the Chinese government to proceed with its expansion of its petrochemical site at Nanjing, China. BAS-YPC is a 50:50 joint venture between BASF and Sinopec, which is based in Beijing. As reported by *Chemical Week* magazine, the expansion will involve upping the steam cracker capacity to 740,000 MT/year of ethylene.

Product sustainability studied

Arizona State University (ASU) and the University of Arkansas will help Walmart, the world's largest retailer, measure the ecological impact of thousands of consumer products, *The Arizona Republic* (Phoenix, USA) newspaper reported in late July.

Researchers from ASU's Global Institute of Sustainability will study how thousands of products are made, shipped, and used, and then publish the information in an online database. The Procter & Gamble Co., Dial Corp., and several other large consumer products companies are also participating. The consortium aims to establish a scientific standard for evaluating the environmental impact of products, the newspaper said. Consumers can then access the online database before making purchase decisions.

KOSTMET database grows

The International Federation of the Societies of Cosmetic Chemists (IFSCC) announced in July that its literature database, known as KOSMET, has now reached more than 48,000 entries.

KOSMET is a bibliographic database covering literature on cosmetic, toiletry, and perfumery science and technology. It contains literature abstracts and is intended for a quick, comprehensive survey search. It does not contain full papers; however, in most cases, full source and address details are given so that users may contact the author or publisher for further information.

The database is available through providers such as STN International, Nerac, and DataStar. A direct search also is possible through IFSCC's own website, www.KOSMET.com. Full results are available by subscription or on a pay-per-view basis.

Research roundup

Researchers in Marseille, France, report on a study of a new cosmetic emulsion with biomimetic molecules. The scientists studied six variables: the nature of the surfactant using three mixture variables, as well as varying percentages of the surfactant, co-surfactant, and squalene. In addition, the researchers measured five properties: stability, centrifugation, viscosity, pH, and microscope analysis.

"Because of the complexity of the study, the optimization of these five responses has been carried out in two steps," writes M. Claeysbruno and colleagues at the University of Pau. "Results have shown that the percentage of squalene exhibits the greatest influence on the stability and on the viscosity of the emulsions."

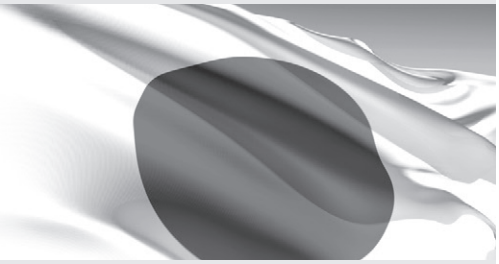
The study appeared in *Chemometrics and Intelligent Laboratory Systems* (*96*:101–107, 2009).

In another recent study, researchers from Poland investigated systems composed of dicephalic N-dodecyl-N,N-bis[(3-D-aldonylamido)propyl]amines C-12-DX (gluconyl GA or lactobionyl LA)/iso-butanol/hydrophilic (diethylene glycol monoethyl ether) or hydrophobic (iso-octane) oils/water "by evaluating isotropic area magnitudes in the pseudoternary phase diagrams, as well as droplet characteristics by electron paramagnetic resonance (EPR) and dynamic light scattering (DLS) spectroscopies at 25, 40, and 55°C. We concluded that in the examined systems a co-surfactant, such as middle-chain alcohol, was needed to obtain large mesophase isotropic areas. The phase behavior and structure of the examined systems were temperature insensitive but they were intimately determined by the nature of the C12-DX and the polarity of the oil phase," the scientists write.

"By adjusting the nature of the oil, as well as the surfactant hydrophilicity, the performed isotropic systems containing low amounts of nonaggressive surfactant could be formulated successfully. Interfacial properties and the dynamic structure

ronmental Protection Agency's SDSI (Safer Detergents Stewardship Initiative) designation. VASKA is based in Berkeley, California, USA.

■■■



Japan's Nicca Chemical will proceed with a delayed project to build a new nonionic surfactant plant in Kashima (Ibaraki prefecture) because of rising demand for fiber production in China, ICIS *Chemical News & Intelligence* reported in late June. The plant is scheduled to be completed in October 2010, ICIS said.

■■■

Kao Corp. GmbH, the German subsidiary of Japan's Kao Corp., has acquired plant-related assets (building and production facilities) of Reichardt International AG (Darmstadt, Germany), which produces premium hair care products. "With this acquisition, Kao Group will develop its core production base for the beauty care business in Europe," *HAPPI* magazine reported in late June.

■■■

In other Kao Corp. news, the company will promote eight personal care brands worldwide, *The Nikkei Weekly* (Japan) newspaper reports. Kao had been focusing on local and regional markets, according to the newspaper, but now aims to compete against The Procter & Gamble Co. and Unilever. Among the brands slated for global promotion are Bioré, Curel, and Molton Brown, the newspaper said. "The firm aims to boost the proportion of overseas sales to 60% of the group total around 2020 from about 30% in fiscal 2008," the report noted.

■■■

The Procter and Gamble Co. (P&G) will build a $100 million laundry products manufacturing plant in Pakistan by mid-2010. The facility will be the company's second in Pakistan, P&G said. ■

of the surfactant/co-surfactant monolayer were studied by the spin probe technique using the 16-doxylstearic acid methyl ester (16-DSE) as the appropriate probe. The polarity of the interface was not affected by temperature but the interface rigidity was dependent upon the nature of the surfactant and oil as well as on temperature. The size of the dispersed domains, evaluated by dynamic light scattering (DLS), was found to be a function of temperature, surfactant content and type of additives," K.A. Wilk and colleagues at Wroclaw University say.

"The investigated oil/water microemulsions (i.e., ranging from 3.0 to 8.8 nm) constituted promising templates for a variety of syntheses of nanostructures with small size and high-capacity solubilizing media," they conclude.

The study appeared in the *Journal of Colloid and Interface Science* (*334*:87–95, 2009).

S&D patents

External skin preparation

Maeda, Saori, Kao Corp., July 2, 2009, WO/2009/081587

Disclosed is an external preparation for the skin, which contains a surfactant or a preservative that is believed to be a causal substance of skin irritation in a reduced amount and therefore has low irritating properties, and also has high preparation stability. Specifically disclosed is an external preparation for the skin, which is characterized by comprising a rhododendrol and/or a derivative thereof, a nonionic surfactant selected from a sucrose fatty acid ester and a polyglycerin fatty acid ester, and a polyhydric alcohol. The external preparation for the skin has low skin irritation properties, an excellent preservative/antifungal effect, and high preparation stability.

Shampoos

Groning, Melanie, *et al.*, Henkel AG & Co. KGaA, June 24, 2009, WO/2009/074366

The invention relates to shampoos that confer "advantageous properties on hair treated therewith and, at the same time, are particularly gentle on dyed hair, wherein the dye is washed out to a significantly lesser extent in spite of a high cleaning performance. The shampoos contain (i) 0.1–15% by weight of a cryptoanionic surfactant, (ii) 0.1–10% by weight of at least one amphoteric surfactant, (iii) 0.1–10% by weight of at least one nonionic surfactant, (iv) 0.001–10% by weight of at least one care material from the group of the cationic guar derivatives and/or of the cationic cellulose derivatives, and/or of the silicones in a cosmetically acceptable carrier.

Fluid loss control agent for viscoelastic surfactant fluids

Huang, Tianping, *et al.*, Baker Hughes Inc., June 23, 2009, US7550413

Alkaline earth metal compounds may be fluid loss control agents for viscoelastic surfactant (VES) fluids used for well completion or stimulation in hydrocarbon recovery operations. The VES fluid may further include proppant or gravel, if it is intended for use as a fracturing fluid or a gravel packing fluid, although such uses do not require that the fluid contain proppant or gravel. The fluid loss control agents may include, but not be limited to, oxides and hydroxides of alkaline earth metal, and in one case magnesium oxide where the particle size of the magnesium oxide is between 1 nanometer to 0.4 millimeter. The fluid loss agent appears to associate with the VES micelles and together form a novel pseudo-filter cake crosslinked-like viscous fluid layer that limits further VES fluid flow into the porous media. The fluid loss control agent solid particles may be added along with VES fluids.

Modified alkoxylated polyol compound

Scheibel, Jeffrey J., *et al.*, The Procter & Gamble Co. (P&G), June 23, 2009, US7550631

The present invention relates to compounds, processes, cleaning compositions, and methods of using said compounds and compositions characterized by comprising a polyol compound, the polyol compound comprising at least three hydroxy moieties, at least one of the hydroxy moieties further comprising an alkoxy moiety, the alkoxy moiety is selected from the group

consisting of ethoxy, propoxy, butoxy, and mixtures thereof; further wherein at least one of the hydroxy moieties further comprise an anionic capping unit.

Alkoxylated amines sulfating process

Reilman, Randall T., *et al.*, The Procter & Gamble Co. (P&G), June 23, 2009, US7550621

The patent has been assigned for a process for sulfating alkoxylated amines, alkoxylated polyols, and hydrophobic polyamine ethoxylate polymers, via the use of sulfuric acid.

Metal-complexing dye, surfactant composition

Sivik, Mark R., *et al.*, P&G, June 23, 2009, US7550422

The invention relates to a composition with a metal-complexing dye and surfactant for giving a color change when in contact with selected metal ions.

Surfactant-based product composition

Yianakopoulos, George, *et al.*, Colgate-Palmolive Co., June 25, 2009, WO/2009/078867

The invention relates to compositions of surfactant-based products containing anionic and nonionic surfactants, one or more sequestering agents, a glycol solvent for the preparation of liquid cleaning compositions. The surfactant-based product may be any type of cleaning product based on surfactants, which include a sequestering agent. Specifically, the invention relates to a cleaning composition with desirable cleansing properties possessing increased grease cutting.

Cationic surfactant

Iwase, Toshiaki, *et al.*, Aisin AW Co., Ltd. and Chuo Chemical, June 25, 2009, WO/2009/078369

The patent is for a novel cationic surfactant having high cleaning ability and low foamability. Specifically, a fatty acid salt of an alkyl quaternary ammonium is used as such a novel surfactant.

Oxyalkylated polyglycerol ester liquid composition

Loeffler, Matthias, *et al.*, Clariant Produkte GmbH, June 30, 2009, US7553495

Compositions are described which comprise oxyalkylated polyglycerol esters, one or more organic solvents, and water. The compositions are exceptionally suitable for the thickening of surfactant-containing systems.

Polyol alkoxylate phosphate ester

Futterer, Tobias, J., *et al.*, Rhodia Inc., June 23, 2009, US7550419

This invention relates to a composition useful as an oral care composition comprising an organophosphate material, additional oral care composition ingredients, for example, a surfactant agent, and optionally an abrasive agent.

Topical personal care composition

Wagh, Asher, Pure USA LLC, June 30, 2009, US7553480

Topical personal care compositions comprising an anti-inflammatory agent, an amphoteric surfactant, a bodifier/humectant, and water and methods of use are disclosed.

Primary detergency improvement method

Benda, Konstantin, *et al.*, Henkel AG & Co. KGaA, July 2, 2009, WO/2009/080575

The invention relates to improving the primary detergency of detergents, especially when washing textiles soiled with oil- and/or fat-containing materials. This is accomplished, in particular, by the incorporation of nitrogen-containing cotensides, produced in particulate form.

People News/ Inside AOCS

Burton wins *inform* contest

Rachel Burton, research and analytic director at Piedmont Biofuels in Pittsboro, North Carolina, USA, is the winner of the 2009 *inform* article idea contest drawing.

AOCS members and Annual Meeting & Expo (AM&E) attendees were asked to submit article ideas for future issues of *inform*. Burton's name was drawn from the many entries; she will receive a free registration to the 101st AOCS AM&E in 2010 in Phoenix, Arizona, USA.

Burton remembers receiving the e-mail sent to meeting registrants and thinking, "I can answer this." In fact, proving the adage that "the early bird gets the worm," she was the first respondent.

"**Michael Haas** [former AOCS president and a researcher at the Eastern Regional Research Center in Wyndmoor, Pennsylvania, USA] introduced me to AOCS three years ago," she explains. "I look forward to the meeting every year because of the high-quality technical information it provides."

At Piedmont Biofuels, Burton is actively evaluating and analyzing materials and technology for the next generation of biofuels and biodiesel. "One of the things we have noticed as an industry laboratory is that most funding [for alternative fuels] isn't going into academia," she said. "Instead, it is industry that is pushing forward the next phase."

PetroSun names new president

James Robinson was selected as the new president of PetroSun, Inc. (Scottsdale, Arizona, USA) on June 9, 2009. He comes to the company with 20 years of experience in helping early-stage companies access capital and grow their business. According to Gordon LeBlanc Jr., PetroSun chief executive officer, Robinson "is uniquely qualified to help PetroSun at this critical point in our evolution as we seek to commercialize our algae-to-biofuel operations."

PetroSun has been working to develop open-air ponds as sites to grow algae for processing into biofuels.

ISU research wins *R&D Magazine* award

Researchers at Iowa State University (ISU; Ames, USA) received one of the 2009 R&D 100 Awards, the editors of *R&D Magazine* announced on July 20. The awards salute the 100 most technologically significant products introduced into the marketplace over the past year.

A team of 10 ISU researchers led by **Hans van Leeuwen**, an Iowa State professor of civil, construction and environmental engineering and president and founder of MycoInnovations, was recognized for its work to use a microscopic fungus to produce biodiesel from plant processing wastes. The research team includes **Tae Hyun Kim** and **David Grewell**, assistant professors of agricultural and biosystems engineering; AOCS member **Sam Beattie**, assistant professor of food science and human nutrition and ISU Extension food safety specialist; **John Verkade**, university professor of chemistry; **Debjani Mitra**, Ph.D. candidate in biorenewable resources technology and food science and human nutrition; **Carol Ziel**, research associate in food science and human nutrition; **Venkat Reddy Chintareddy**, postdoctoral research associate in chemistry; **Priyanka Chand**, Ph.D. candidate in agricultural and biosystems engineering; and **Melissa Montalbo-Lomboy**, postdoctoral research associate in agricultural and biosystems engineering.

The special biodiesel they developed, now being commercialized as Mycofuel™, is made from lignocellulosic biomass. The process involves treating switchgrass, corn stover, or forestry wastes with ammonia and naturally occurring white-rot fungi to degrade the cellulose. The resulting sugars are used to grow a different, filamentous mold that is about 60% oil. The oil is released by ultrasonication and is then recovered by extraction with an organic solvent; subsequently it is transformed into biodiesel. A by-product of the leftover fungal biomass can be used as a high-protein animal feed. The water can be reused in the fermentation process.

Solae appoints Matthes

Catherine Matthes was appointed senior director of new business development by Solae, LLC (St. Louis, Missouri, USA) in late July 2009. She will report to Michele Fite, vice president of global stratey and marketing, specialty business, and new business development at Solae. Matthes will be responsible for establishing business development strategies and preparing plans to implement. She also will advise the Solae leadership team of implications of new business opportunities. Matthes has more than 20 years of business and financial experience in various positions in science and pharmaceutical companies.

Solae's business is developing soy-based technology and ingredients for food and nutritional products.

CONTINUED ON PAGE 596

Phoenix rising

Catherine Watkins

Chances are that the 101st AOCS Annual Meeting & Expo (AM&E), scheduled for May 16–19, 2010, will be marked by an unbroken string of sunny days. Why? Because the host city, Phoenix, has an average of 211 sunny days per year (with an additional 85 days that are only partly cloudy).

As the capital and largest city of the US state of Arizona, Phoenix is well known for its culture, its sports, and its food—all of which will be available to meeting attendees. Add to that a brand-new headquarters hotel, a newly renovated convention center, and nearby scenic wonders such as the Grand Canyon, and it is clear that the first meeting of AOCS' second century is sure to be memorable.

The Sheraton Phoenix Downtown Hotel, which opened in October 2008, is Arizona's largest hotel. The property features the District American Kitchen and Wine Bar, a Microsoft-engineered "Link@Sheraton" communications lounge, an outdoor pool and sundeck, and a fitness center worthy of Olympic athletes. Courtesy of Greater Phoenix CVB.

information

More information about the city of Phoenix is available at www.visitphoenix.com. Look for "PHX in Your Pocket," a printable guide that features maps of the city's new light-rail system. The sleek trains stop at attractions such as the Phoenix Art Museum, Heard Museum, Chase Field, and US Airways Center, and offer meeting attendees a fast ride from the airport to the headquarters hotel. The free guide also includes a hiking-trail chart and a list of 25 things to see and do in the metropolitan area.

CONVENTION CENTER AND HOTEL

The newly expanded Phoenix Convention Center has tripled its size to 900,000 square feet (more than 800,000 square meters) and added the latest in technology and services. It houses 11 exhibit halls (including one the size of five football fields) and a food court with five themed eateries. Its three-building campus is decorated by $3.2 million worth of public art.

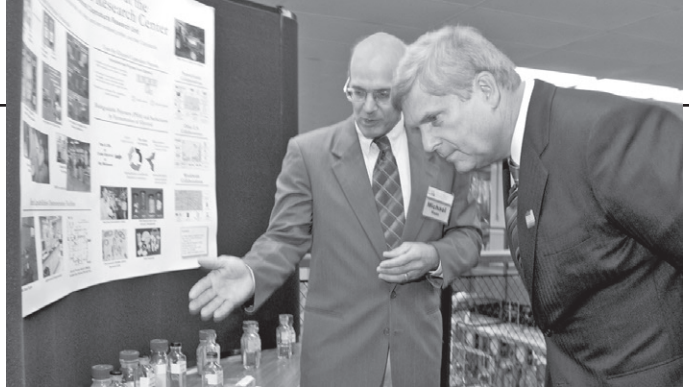
The Center is wired with a fiber network that runs throughout, including every exhibition hall and meeting room. Point-to-point connections are available to and from almost any location in the entire center. In addition, the facility's wireless infrastructure provides coverage throughout the multilevel campus of buildings for personal devices such as cell phones and includes wireless Internet access in designated areas. The facility also provides lecture halls with wireless voting and real-time translation technology.

Downtown Phoenix—which is known as Copper Square to locals—has been revitalized by a $2.3 billion renovation project. Among the improvements is the new Sheraton Phoenix Downtown, which will serve as the AOCS AM&E headquarters hotel. Conference participants will also receive special rates at the Hyatt Regency Phoenix. Both hotels are across the street from the Phoenix Convention Center and offer a multitude of world-class services and amenities.

Staying at one of the official meeting hotels is cost-effective in several ways. First, AOCS convention rates are significantly lower than rates offered on the web. Second, strong hotel bookings help AOCS continue to negotiate better rates at future annual meetings.

Whichever hotel you book, be on the lookout for Phoenix's "ambassadors" as you walk between your hotel and the Conven-

CONTINUED ON PAGE 596



(above) AOCS Member Michael Haas, left, shares research activities on biodiesel at the Eastern Regional Research Center (ERRC) with Secretary of Agriculture Tom Vilsack.

(left) AOCS member Kevin Hicks, right, escorts Secretary Vilsack into the ERRC.

Agriculture Secretary visits ERRC

On July 23, 2009, US Secretary of Agriculture **Thomas Vilsack** visited the Eastern Regional Research Center (ERRC; Wyndmoor, Pennsylvania) of the Agricultural Research Service, US Department of Agriculture (USDA). This was the first time in the 69 years of the existence of the ERRC that the Secretary of Agriculture had visited.

His purpose was to review the Center's pioneering research programs in sustainable bioenergy, food safety, and health-promoting foods. Accompanying the Secretary was Deputy Undersecretary for Rural Development **Cheryl Cook**. The Secretary addressed the entire Center staff at the end of the visit and thanked the staff for helping him achieve his objectives in rural development, sustainable agricultural bioenergy, obesity prevention, food safety and security, and for making USDA effective and relevant "everyday and everyway."

Miller heads Carbonics Capital Corp.

Paul T. Miller was appointed president and chief executive officer of Carbonics Capital Corp. (New York City, New York, USA) in late June. Miller founded and was formerly the president of Sustainable Systems, an oilseed processing facility specializing in the production of high-oleic vegetable oils for food applications.

Carbonics Capital announced the company's first project under Miller's leadership would be to purchase the Sustainable Systems oilseed crush facility in Culbertson, Montana, USA, from GreenShift Corp. (New York City, New York). The goal is to restructure and reposition this facility for the processing of carbon-neutral second-generation feedstocks for biofuel applications.

tion Center. These cheerful functionaries carry maps, business directories, event schedules, dining guides, and two-way radios as they search for visitors in need of assistance. The ambassadors are on duty seven days a week, 365 days a year, patrolling Copper Square on foot and by bike. Each ambassador has also logged 160-plus hours of in-house and field training (public safety, crime prevention, first aid, and cardiopulmonary resuscitation, to name a few).

RESTAURANTS AND CULTURAL VENUES

Captivating exhibits are provided by numerous cultural venues in downtown Phoenix, including **Arizona Science Center**, **Phoenix Art Museum,** and **Heard Museum**. The performing arts can be experienced at the historic **Orpheum Theatre**, **Herberger Theater Center,** and **Dodge Theatre**.

Heard Museum provides fascinating insights into the culture and history of Arizona's 22 Native American tribes. It features both traditional and contemporary works, including what is perhaps the world's greatest collection of Kachina dolls. And here is a tip for visitors in search of souvenirs: The Heard Museum Shop reportedly is one of best places in Phoenix to buy authentic Native Indian jewelry and art.

Chase Field, home of the Arizona Diamondbacks baseball team, and **US Airways Center**, the 17,000-seat facility that hosts the National Basketball Association's Phoenix Suns, provide sports fans, concert-goers, and special-event patrons with more than 150 annual events. The city's new light-rail system stops at all of these attractions, as well as providing a 20-minute ride to neighboring Tempe, home to the Mill Avenue entertainment and shopping district.

Dining and sociability always rank high on the must-do lists of AOCS meeting attendees; restaurants of every type can be found in downtown Phoenix. The highlight of local cuisine is its Southwestern fare. After first drawing upon the traditions of Native Americans, Southwestern cuisine was spiced up by Spanish colonists, Mexican settlers, and US pioneers. This international convergence eventually led to the modern Southwestern cooking available in many popular downtown restaurants, along with traditional and international cuisine from Asia, Europe, Japan, and Mexico.

SCIENTIFIC PROGRAM

No discussion of the AM&E is complete without a mention of the scientific program. Meeting General Chairperson Douglas M. Bibus has issued the call for papers; the deadline for submitting declarations of intent is October 5. Visit http://AnnualMeeting.aocs.org for more information and to submit your declaration. And then visit Phoenix next May for the 101st AOCS Annual Meeting & Expo. We'll save you a seat on the Metro light-rail train.

Catherine Watkins is associate editor of inform *and can be reached at cwatkins@aocs.org.*

Technical Program highlights for AOCS' 2nd International Congress on Biodiesel

AOCS' 2nd International Congress on Biodiesel will be held November 15–17, 2009, at The Westin Grand Munchen Arabellapark in Munich, Germany. The conference will feature a wide array of international insights on biodiesel's continually evolving science and technology. The congress also provides an invaluable opportunity to meet important players in the industry, whose work and research will be on display during the congress' diverse Technical Program (see below).

For the most up-to-date information on the congress, including the latest additions to the Technical Program, poster sessions, registration and hotel information, and a schedule of events, be sure to visit www.aocs.org/meetings/biodiesel09/ or contact AOCS Meetings Specialist Mindy M. Cain (email: mindyc@aocs.org; phone: +1-217-693-4827).

Tentative Technical Program (for the latest updates, as well as full presenter affiliations, visit www.aocs.org/meetings/biodiesel09/)

SUNDAY

Opening Keynote, Thomas Mielke
Biodiesel Developments in Asia, Mohd Basri Wahid
North American Perspective, J. Jobe
European Perspective, TBA.

MONDAY

Cleaning up Biodiesel

Chair: R. Verhé and S. Fenwick
Analysis of Trace Components in Biodiesel and the Impact on Cold Soak Filtration, Teresa Alleman
Strategies for Biodiesel Purification, Derek Masterson
Understanding the Low Temperature Properties of Biodiesel, M. Brewer, R. Malpas
Purification Methods for Biodiesel and Glycerin, Barbara Harten
Factors Affecting the Cold Soak Filtration Test of Biodiesel, N. Zyaykina, C. Echim, W. De Greyt, F. Soragna, M. Kellens
Effect of Minor Components Content on Precipitate Formation in Biodiesel, Haiying Tang, Steven O. Salley, K.Y. Simon Ng
Purification of Biodiesel Prepared from Used Frying Oils by Distillation, Roland Verhé
Detection and Remediation of Microbially Contaminated Petroleum and Biomass Fuels, E. English

Engine Operability and Catalyst Performance I

Chair: J. Krahl and K. Oyama
A Quantitative Evaluation of an On-Highway Trucking Fleet to Compare No. 2 ULSD and B20 Fuels and Their Impact on Overall Fleet Performance, C. McKinley, J. Lumkes, B. Tao
Characterization of Emissions from Heavy-Duty Engines Operating with Varying Biodiesel Blends and Emission Control Systems, Debbie Rosenblatt
Biodiesel Blend Effects on Emissions and Public Health, Olaf Schröder
Evaluation of Tractor Performance Operating on 100% Biodiesel, N.D. Rill, G.R. Cauffman
Performance, Durability and Stability of a Multi Fueled Power Generator, Kapila WaduMesthrige, Nickolas Johnson, Mark Winston-Galant, Steven O. Salley, K.Y. Simon Ng
Impact Study of High-level Biodiesel Blends on Exhaust Emission with Advanced Aftertreatment Systems, T. Kaneko

Feedstock Options—Development of Resources for Biodiesel Production

Chair: M. Mittelbach and S. Tyson
Update of the State-of-the-Art of Marine Microalgae Production using Electric Power Plant Wastes, Ami Ben-Amotz
Corn Oil Extraction Processes, Economics, and Product Quality, Lawrence D. Sullivan
Isolation of Phorbol Esters from *Jatropha Curcas* Oil and Quality of Produced Biodiesel, Rakshit K. Devappa, Jeroen Maes, Harinder P.S. Makkar, Wim De Greyt, Klaus Becker
Field Pennycress (*Thlaspi arvense* L.) Oil. A Promising Source of Biodiesel, B.R. Moser, G. Knothe, S.F. Vaughn, T.A. Isbell
Life Cycle Energy Analysis for the Production of Biodiesel from Rendered Lipids in the US, D.E. Lopez, J. Mullins, D.A. Bruce

Analytical Methods and Quality Aspects

Chair: F. LaCoste and B. Cahill
ASTM—US Standards and Initiatives, S. Howell
Changes under Consideration for the EN 14214 Specification, Barry Cahill
Comparison of Analytical Approaches for the Determination of Steryl Glycosides in Biodiesel, S. Schober, A. Studentschnig, M. Mittelbach
Shelf Life Improvement of Biodiesel and Plant Oil Fuels with Synthetic Antioxidants, Axel Ingendoh
New Advances in the Use of Fourier Transform InfraRed for the Analysis of Biodiesel, Barbara Stefl, Nan Wang, Chinghui Tseng
Biodiesel Long Term Storage Oxidative Stability and Performance. A Pilot-scale Case Study, Ibrahim Abou-Nemeh
Oxidation Stability of Biodiesel: Analytical Methods Assessment, Xavier Montagne
Overview of World Standards on Biodiesel, Tammy Klein

Engine Operability and Catalyst Performance II

Chair: J. Krahl and K. Oyama

An Experimental Investigation of the Origin of Increased NO_x Emissions When Fueling a Heavy-Duty Compression-Ignition Engine with Soy Biodiesel, Charles J. Mueller, Andre L. Boehman, Glen C. Martin

The Effect of Animal Fat Methyl Ester Blends on the Regulated and Unregulated Emissions from a Euro Four Passenger Vehicle, George Karavalakis, Dimitrios Ampatzoglou, Stamoulis Stournas, Evangelos Bakeas

Biodiesel Performance with SCR and DPF Systems, R.L. McCormick, A. Williams, J. Ireland, D. Pedersen

Impacts of Biodiesel Fueling on Engine Lubricants, Stephen R. Kirby, Peng Ye, Thomas McGuire, Yu Zhang, André L. Boehman, Michael Alessi, Katherine Richard, Stuart McTavish

Biodiesel Blend NOx Emissions from Heavy-Duty Diesel Engines, John Nuszkowski, Gregory Thompson

Diesel Engine Emissions from Combustion of Diesel, Biodiesel and Biodiesel Blends Cause Different Mutagenicity, Jürgen Bünger, Jürgen Krahl, Axel Munack, Olaf Schröder, Jens Schaak, Markus Trißler, Ernst Hallier, Götz Westphal, Thomas Brüning

Future and Developing Production Technologies

Chair: W. De Greyt and S. Saka

New Generation Heterogeneous Transesterification Catalyst, Dave Sams

Chemical Interesterification of Vegetable Oil with Methyl Acetate: Kinetics and Thermodynamics, A. Casas, J.R. Ruiz, M.J. Ramos, A. Perez

Enzymatic Production of Biodiesel Fuel from Various Oil Sources in Solvent-free System, Yomi Watanabe

Enzymatic Production of Fatty Acid Ethyl Esters, J. Brask, P.M. Nielsen, L.S. Pedersen, M.L. Damstrup, H.C. Holm

Use of Heterogeneous Catalyssts for the Conversion of FFA into FAME, Rudolf Wagner

Immobilization of Rhizomucor Miehei Lipase on a Fibrous Support for Biodiesel Production, Gülçin Eylem Özarslaner, Mehmet Erhan Kanışlı, Eda Öndül, Nadir Dizge, Nedim Albayrak

Biodiesel from Low Quality Feedstock using Alkali Metal Ion Doped Calciumoxide as Heterogeneous Catalyst, Amjad Ali, Dinesh Kumar, Vishal Mutreja

A New Process for Biodiesel Production Using Supercritical Carboxylate Esters.
Shiro Saka

TUESDAY

Alternative (i.e. not biodiesel) Diesel Engine Fuels

Chair: A.A. Boateng and P.A.Z. Suarez

To Burn or Not to Burn: Distributed Pyrolysis to Refinable Crude Bio-oil and Soil-Amending, Carbon Sequestering Biochar, A.A. Boateng

The Possible Role of Fast Pyrolyis in the Production of 2nd Generation Biofuels, Wolter Prins

Biodiesel and Renewable Diesel: A Critical Comparison, G. Knothe

Performance of Tractors Fueled with Raw Vegetable Oil, Glen R. Cauffman, Douglas H. Schaufler

Bio-thermal Valorisation of Biomass the-BtVB Process at Hainhaus/Odenwald, A. Hornung, A. Apfelbacher, S. Sagi

Hydrocarbons from Thermo-catalytic Cracking of Fatty Raw-materials, P.A.Z. Suarez

Approaches to Renewable Diesel Production, P.L. Hanks, K.Y. Cole, W.E. Lewis

Strong Genotoxic Effects of Diesel Engine Emissions from Combustion of Vegetable Oils, Jürgen Bünger, Jürgen Krahl, Jörn Bünger, Axel Munack, Olaf Schröder, Claudia Handrich, Ernst Hallier, Thomas Brüning, Götz Westphal

Biodiesel: Large Scale Transport; New Uses for Glycerol; and General Topics

Chair: R. Lawrence and P.M. Pagliaro

Glycerol Acetals as Fuel Additives for Gasoline and Biodiesel, Claudio J.A. Mota, Carolina X. A da Silva, Paulo H. S. Ribeiro, Valter L.C. Gonçalves

Multi-Function Catalysts for Gas Phase Glycerol Conversion, P.C. Hulteberg, J.G.M. Brandin

Logistical Challenges Associated with Transporting Biodiesel Blends on Refined Products Pipelines, Rod Lawrence

Evaluation of Soy Methyl Ester-Polystyrene Blends for Use in Concrete, K. Coates, J. Weiss, B. Tao

High Voltage Separation of Biodiesel from Glycerin, Greg Austic, Rachel Burton

Sustainability Aspects of Biodiesel

Chair: M.Q. Wang and Franziska Müller-Langer

Roundtable on Sustainable Biofuels (RSB): Biofuel Sustainability Protocol Development, Alwin Kopse

CEN Sustainability Standards in Support of the EC Directive's Implementation, O. Costenoble

US Efforts on Biofuel GHG Regulation Development, John Courtis

GHG Emissions and Sustainability Aspects of Biodiesel, N. Jungbluth

NBB Sustainability Committee Mission and Activities, D. Scott

Biofuel Life Cycle GHG Emissions and Land Use Change Effects, B. Stokes

Land Clearing and Biofuel Carbon Debt, Steffen Mueller

Sustainable Palm Oil Production—Environmental and Socio-economic Aspects, Birka Wicke

Biofuel Support Policies and Their Assessment, Martin Von Lampe

Future Perspectives

Biodiesel in Latin America: Developments, Supply, and Opportunities, Iderlon Azevedo

Lipids as Source of Food and Fuel—Will There be Enough?, Frank Gunstone

Global Mandates and Projected Growth of the Biodiesel Industry, Claudio Rocchietta

Patents

Published Patents

Transparent oil-in-water emulsion

Mercier, M., *et al*., MMP Inc., February 10, 2009, US7488471B2

The present invention relates to transparent or clear emulsions for cosmetic or pharmaceutical use. The transparent emulsions of the present invention comprise an oil phase, containing at least one lipophilic solvent; an aqueous phase; and an emulsifying system containing at least one non-ethoxylated fatty acid ester emulsifier having a hydrophilic-lipophilic balance from about 11 to about 16. Preferred non-ethoxylated fatty acid ester emulsifiers are sucrose esters, in particular sucrose palmitate and sucrose laurate.

Process for producing fatty acid alkyl ester

Tsuto, K., and Koshikawa, T., REVO INTERNATIONAL INC., February 10, 2009, US7488837B2

The present invention relates to a process for preparing an alkyl ester of a fatty acid, including the steps of carrying out an esterification reaction between a free fatty acid contained in a fat or oil and an alcohol; carrying out a transesterification reaction between a fat or oil and an alcohol; and refining an alkyl ester of a fatty acid, wherein at least any one of three steps is carried out in a corresponding step selected from the steps of (i) contacting a fat or oil and an alcohol with a resin-foamed article to which a catalyst containing fine strongly acidic particles is supported or a resin-foamed article modified to be strongly acidic, and carrying out an esterification reaction between a free fatty acid in the fat or oil and the alcohol; (ii) contacting a fat or oil and an alcohol with a resin-foamed article to which a catalyst containing fine alkali particles is supported, and carrying out a transesterification reaction between the fat or oil and the alcohol; and (iii) contacting a reaction mixture obtained by the transesterification reaction with a resin-foamed article to remove impurities via adsorption, and refining an alkyl ester of a fatty acid.

Oil soluble photoprotective compounds and compositions from plant oil processing

Reaney, M., KRU Ltd., February 24, 2009, US7494662B2

Co-product streams derived from the manufacture of vegetable oil were further processed, producing materials that possess strong absorbance of visible and ultraviolet light. The compounds contributing to the light absorbance were increased and standardized to produce a fat-soluble composition with consistent and strong absorbance of ultraviolet and visible light. The fat-soluble composition is a useful photoprotective agent for various applications including protection of herbicides and pesticides. In a preferred embodiment acidulated vegetable oil is blended to a constant absorbance of light between 190 and 400 nm and used in a formula to protect a field-applied herbicide.

Antifogging agent for plastics

Daute, P., and Brand, E.-U., Cognis Oleochemicals GmbH, February 10, 2009, US7488838B2

The invention relates to antifogging agents for plastics that are obtainable by transesterification of native oils with PEG (polyethylene glycol) or mixtures of PEG and other polyols, to plastics containing these antifogging agents, and to the use of mixtures obtainable by transesterification of native oils with PEG or mixtures of PEG and other polyols as antifogging agents in plastics.

Process for the recovery of a phytolipid composition

Zima, G., *et al*., Eastman Chemical Co., February 17, 2009, US7491412B2

Disclosed is a process for the recovery of a phytolipid composition from a vegetable oil by-product. The phytolipid composition produced comprises squalene, phytosterols, mixed tocopherols and tocotrieneols, and vegetable wax and is useful as an emollient. The phytochemical composition may be applied directly to the skin to provide emolliency. Alternatively, the phytolipid composition may be formulated in various aqueous or anhydrous cosmetic compositions such as creams, lotions, gels, ointments, lip balms, sticks, or pencils for treatment of the skin and lips. The phytolipid composition also may be incorporated into foods, beverages, and nutraceuticals to provide health benefits.

Lipase-catalysed esterification of marine oil

Haraldsson, G., *et al*., Pronova Biocare AS, February 17, 2009, US7491522B2

Marine oil compositions that contain EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) as free acids or hexyl esters are esterified with ethanol in the presence of a lipase catalyst under essentially organic solvent-free conditions and separated by distillation.

Hydrogenation with copper compositions catalyst

Sleeter, R., Archer Daniels Midland Co., February 17, 2009, US7491820B2

Copper compositions that are useful as hydrogenation catalysts are disclosed. In particular, the copper compounds are catalysts for the selective hydrogenation of oils that contain unsaturated fatty acyl components such as unsaturated vegetable oils. Methods of preparing the copper compositions are also disclosed. Methods of hydrogenating unsaturated compositions that contain at least two sites of unsaturation using the hydrogenation catalysts, along with products obtained from the hydrogenation reactions described herein, are also disclosed.

Patent information is compiled by Scott Bloomer, a registered US patent agent with Archer Daniels Midland Co., Decatur, Illinois, USA. Contact him at scott_bloomer@admworld.com.

Book Review

Extracting Bioactive Compounds for Food Products, Theory and Applications
M. Angela A. Meireles (ed.)
CRC Press/Taylor and Francis Group, 2008, 464 pages
ISBN: 978-1-4200-6237-3, $169.99

William E. Artz

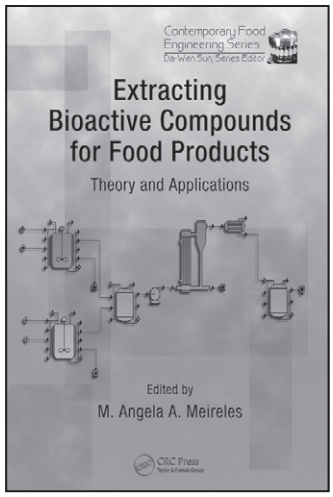
M. Angela A. Meireles has edited an excellent text on the extraction of flavor and bioactive compounds using various methods, including steam distillation, low-pressure solvent extraction using a variety of technology-assisted methods, supercritical, and high-pressure solvent extraction. The book ends with a chapter on the isolation and concentration of the extracted compounds. The text is well referenced with approximately 1,000 references. The references are usually located at the end of each chapter; a couple of chapters include additional references after each major section.

Each chapter discusses the theory behind the respective extraction method, including equations that to model the extraction process, followed by example products and processes.

The first chapter contains subchapters on two applications: vegetable oil deodorization and volatile oil extraction. The final subchapter in this section includes a section that would be particularly useful for industrial scientists because it discusses a critical aspect that is not often covered in engineering textbooks: the cost of manufacturing for various volatile flavor oil sources such as anise, rosemary, pepper, and thyme. Included are equations for modeling the cost, and numerous figures on the manufacturing cost vs. the solvent-to-feed ratio and extraction time.

The third chapter is also on distillation, but the focus is on fermented and distilled beverages such as whiskey, rum, vodka, etc. Single column, multicolumn, and pot stills are discussed. The chapter contains equations designed to model ethanol isolation, as well as various congeners such as the fusel alcohols and esters. The examples concentrate on cachaça, which is a Brazilian product derived from fermented sugar cane juice. Cachaça differs from rum in its flavor profile, in part because of the absence of the *Clostridium* sp. fermentation that occurs during the normal rum fermentation process. The clostridia provide a large percentage of the organic acids that eventually comprise the high ester content common in rums produced in the Caribbean and some South American countries. This chapter alone would be worth the book price for anyone producing distilled beverages if they were interested in more fully understanding the distillation process and, more importantly, gaining better control of the process.

The chapter on low-pressure extraction starts with a discussion of the fundamentals, followed by a discussion of equations



that can be used to model the kinetics and extent of extraction. The first set of examples includes antioxidants, natural pigments, and phenolic compounds. Again, the last section of the chapter is an economic evaluation of the cost of manufacturing. The authors use sage and macela (which is from the same plant family as chamomile; its flowers are also used as a tea base for medicinal purposes in Brazil) as their case studies.

There is a very good chapter on liquid-liquid extraction as applied to vegetable oil refining. After a large section on the equations useful for modeling the process, the authors include a state-of-the-art literature review, followed by a process example: the deacidification of vegetable oils.

Chapter six covers supercritical and pressurized fluid extraction, as applied to the food industry. After an extensive chapter on the equations useful for modeling the process, there is a longer (30-page) chapter on the extraction of antioxidants (AO) using supercritical fluid. The authors list a large number of feedstocks and the AO activity of the extracts.

The next subchapter is on cashews and the extraction of bioactives from cashew trees and nuts. This is followed by a subchapter on orange oil essence extraction and then coffee aroma extraction. As usual, the chapter ends with a subchapter on the cost of manufacturing (COM). Some simple methods to estimate the COM for supercritical fluid-based extractions are illustrated by two case studies on clove and ginger that could easily be applied to other spice extracts.

The final chapter is an excellent extension of the earlier chapters, with a focus on the concentration of the extracts produced in the earlier chapters using adsorption/desorption. There are several pages of modeling equations, followed by a description of some of the equipment used for the process. The authors include several examples that emphasize the removal of undesirable compounds, e.g., drinking water purification, sugar cane refining, tea and coffee decaffeination, glycerol cleanup after biodiesel production, and fruit juice purification. This section includes a table with approximately 30 examples (and the corresponding references).

This book was written by food and chemical engineers, for engineers and scientists in the food industry, as well as those interested in research on these topics (graduate students and food scientists). The emphasis is on industrial applications in the food industry. It would be an excellent addition to the library of anyone interested in the extraction and isolation of a component or components from a natural product, particularly those interested in selective flavor or bioactive component extractions or removing undesirable components from a food product.

William Artz has been a faculty member at the University of Illinois at Urbana-Champaign for ~25 years, and has written several publications on supercritical fluid extraction and processing. He can be reached at wartz@illinois.edu.

Extracts & Distillates

Separation of triacylglycerols and free fatty acids in microalgal lipids by solid-phase extraction for separate fatty acid profiling analysis by gas chromatography

Paik, M.-J., H. Kim, J. Lee, J. Brand, and K.-R. Kim, *J. Chromatogr. A 1216*:5917–5923, 2009.

Microalgal lipids were separated into two fractions, triacylglycerols (TAG) and free fatty acids (FFA), by solid-phase extraction employing sodium carbonate as the sorbent and dichloromethane (20% by volume) in *n*-hexane as the extracting solvent. The TAG fraction was then saponified, followed by acidification, extraction, and *tert*-butyldimethylsilyl esterification. The FFA fraction was directly acidified, extracted, and derivatized. From the lipid extracts of eight microalgal species examined, a total of 13 fatty acids were detected in the TAG fractions and nine were found in the FFA fractions, with a much higher total TAG content in all microalgae. Oleic acid was the most prominent fatty acid in three species, α-linolenic acid was more abundant in two others, and palmitic acid was present in highest concentration in the remaining three species.

Anticancer effects of phytosterols (Review)

Woyengo, T.A., V.R. Ramprasath, and P.J.H. Jones, *Eur. J. Clin. Nutr. 63*:813–820, 2009.

Phytosterol and stanol (or phytosterols) consumption reduces intestinal cholesterol absorption, leading to decreased blood LDL (low-density lipoprotein)-cholesterol levels and lowered cardiovascular disease risk. However, other biological roles for plant sterols and stanols have also been proposed. The objective of this review is to critically examine results from recent research regarding the potential effects and mechanisms of action of phytosterols on forms of cancer. Considerable emerging evidence supports the inhibitory actions of phytosterols on lung, stomach, as well as ovarian and breast cancer. Phytosterols seem to act through multiple mechanisms of action, including inhibition of carcinogen production, cancer-cell growth, angiogenesis, invasion and metastasis, and through the promotion of apoptosis of cancerous cells. Phytosterol consumption may also increase the activity of antioxidant enzymes and thereby reduce oxidative stress. In addition to altering cell-membrane structure and function, phytosterols probably promote apoptosis by lowering blood cholesterol levels. Moreover, consumption of phytosterols by healthy humans at the recommended level of 2 g per day does not cause any major health risks. In summary, mounting evidence supports a role for phytosterols in protecting against cancer development. Hence, phytosterols could be incorporated in the diet not only to lower the cardiovascular disease risk but also to potentially prevent cancer development.

Olive oil composition as a function of nitrogen, phosphorus, and potassium plant nutrition

Dag, A., E. Ben-David, Z. Kerem, A. Ben-Gal, R. Erel, L. Basheer, and U. Yermiyahu, *J. Sci. Food Agric. 89*:1871–1878, 2009.

Macronutrients play fundamental roles in processes affecting olive oil productivity and are expected to influence oil composition. A necessary step in optimal nutrient application management for olives is an understanding of the relationship between olive tree nutritional status and oil quality parameters. We studied the independent effects of N, P, and K concentrations in irrigation solution on the oil quality of 'Barnea' olives by applying a wide range of macronutrient concentrations under highly controlled conditions. Oil composition was significantly influenced by P and N levels, while K levels had only a minor effect. Unsaturation levels were unaffected by the treatments but, within the unsaturated fatty acids, the levels of PUFA (polyunsaturated fatty acid) increased compared to those of MUFA (monounsaturated fatty acid). Specifically, levels of the MUFA C18:1, polyphenol content, and peroxide values decreased while levels of the PUFA C18:3 increased in response to higher doses of N and P. Decreased MUFA and polyphenol levels coupled with increased omega-3 levels demonstrated a potential negative influence on oil profile alongside increased nutritional benefits. The sum of effects on oil yield and composition should be considered in designing nutrient application management strategies for olive orchards.

Quantitative analysis of sphingolipids for lipidomics using triple quadrupole and quadrupole linear ion trap mass spectrometers

Shaner, R.L., J.C. Allegood, H. Park, E. Wang, S. Kelly, C.A. Haynes, M.C. Sullards, and A.H. Merrill Jr., *J. Lipid Res. 50*:1692–1707, 2009.

Sphingolipids are a highly diverse category of bioactive compounds. This article describes methods that have been validated for the extraction, liquid chromatographic (LC) separation, identification, and quantification of sphingolipids by electrospray ionization, tandem mass spectrometry (ESI-MS/MS) using triple quadrupole (QQQ, API 3000) and quadrupole-linear-ion trap (API 4000 QTrap, operating in QQQ mode) mass spectrometers. Advantages of the QTrap included: greater sensitivity, similar ionization efficiencies for sphingolipids with ceramide vs. dihydroceramide backbones, and the ability to identify the ceramide backbone of sphingomyelins using a pseudo-MS^3 protocol. Compounds that can be readily quantified using an internal standard cocktail developed by the LIPID MAPS Consortium are: sphingoid bases and sphingoid base 1-phosphates, more complex species such as ceramides, ceramide 1-phosphates, sphingomyelins, mono- and di-hexosylceramides, and these complex sphingolipids with dihydroceramide backbones. With minor modifications, glucosylceramides and galactosylceramides can be distinguished, and more complex species such as sulfatides can also be quantified when the internal standards are available. LC ESI-MS/MS can be utilized to quantify a large number of structural and signaling sphingolipids using commercially available internal standards. The application of these methods is illustrated with RAW264.7 cells, a mouse macrophage cell line. These methods should be useful for a

wide range of focused (sphingo)lipidomic investigations.

Extraction, purification, and characterization of wax from flax (*Linum usitatissimum*) straw

Athukorala, Y., G. Mazza, and B.D. Oomah, *Eur. J. Lipid Sci. Technol. 111*:705–714, 2009.

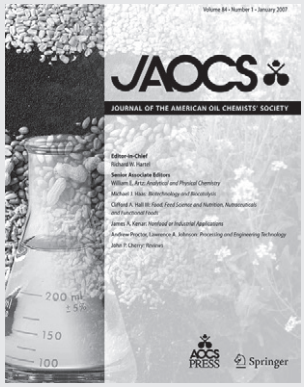
The chemical composition and selected physical parameters of wax extracted from flax straw with supercritical CO_2 (SC-CO_2) and hexane have been determined. From the GC/MS (gas chromatography/mass spectrometry) results, clear variations in composition and component distributions were observed between SC-CO_2- and hexane-extracted samples. The major components of the SC-CO_2 and hexane extracts from three flax cultivars were: fatty acids (36–49%), fatty alcohols (20–26%), aldehydes (10–14%), wax esters (5–12%), sterols (7–9%), and alkanes (4–5%). Purification of SC-CO_2-extracted wax with silica gel chromatography yielded 0.4–0.5% (dry matter) and was composed primarily of wax esters (C_{44}, C_{46}, and C_{48}) and alkanes (C_{27}, C_{29}, and C_{31}). UV-vis (ultraviolet-visible) scans of the purified wax samples exhibited two main peaks indicating the presence of conjugated dienes and carotenoids or related compounds. Fourier-transform infrared results showed prominent peaks at 2918 (–C-H), 2849 (–C-H), 1745 (–C=O), 1462 (–C-H), 1169 (–C-O), and 719 cm^{-1} (–$(CH_2)_n$–), with NorLin wax showing a slightly deviating pattern compared with the other samples. Thermal analysis by differential scanning calorimetry revealed a mean melting point of 55–56°C and oxidation temperatures of 146–153°C for purified wax from flax straw processed using different procedures.

Rapid authentication of olive oil adulteration by Raman spectrometry

Zou, M.-Q., X.-F. Zhang, X.-H. Qi, H.-L. Ma, Y. Dong, C.-W. Liu, X. Guo, and H. Wang, *J. Agric. Food Chem. 57*:6001–6006, 2009.

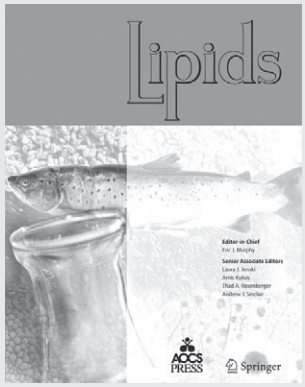
The authentication of olive oil and its adulteration with lower-priced oils are still serious problems in the olive oil industry. In this study, a method based on the intensity ratio of the Raman spectroscopy vibration

AOCS Journals



Journal of the American Oil Chemists' Society (August)

- *Journal of the American Oil Chemists' Society* (August)
- Determination of essential fatty acids in captured and farmed matrinxã (*Brycon cephalus*) from the Brazilian Amazonian area, Almeida, N.M., N.S. Janzantti, and M.R.B. Franco
- Physicochemical, textural, and viscoelastic properties of palm diacylglycerol bakery margarine during storage, Cheong, L.-Z., C.-P. Tan, K. Long, M.S.A. Yusoff, and O.-M. Lai
- Organogel-based emulsion systems, micro-structural features and impact on *in vitro* digestion, Duffy, N., H.C.G. Blonk, C.M. Beindorff, M. Cazade, A. Bot, and G.S.M.J.E. Duchateau
- Determining ethyl esters in fish oil with solid phase microextraction and GC–MS, Sullivan, J.C., S.M. Budge, and M. St-Onge
- Characterization of the seed oil and meal from *Monechma ciliatum* and *Prunus mahaleb* seeds, Mariod, A.A., K.M. Aseel, A.A. Mustafa, and S.I. Abdel-Wahab
- Quantitative analysis of dairy phospholipids by ^{31}P NMR, MacKenzie, A., M. Vyssotski, and E. Nekrasov
- Rheological properties of candelilla wax and dotriacontane organogels measured with a true-gap system, Morales-Rueda, J.A., E. Dibildox-Alvarado, M.A. Charó-Alonso, and J.F. Toro-Vazquez
- The stabilizing effects of polyols and sugars on porcine pancreatic lipase, Gangadhara, P.R. Kumar, and V. Prakash
- An efficient binary solvent mixture for monoacylglycerol synthesis by enzymatic glycerolysis, Zhong, N., L. Li, X. Xu, L. Cheong, B. Li, S. Hu, and X. Zhao
- Influence of temperature on growth and peak oil biosynthesis in a carbon-limited medium by *Pythium irregulare*, Cantrell, K.B., and T.H. Walker
- Chemical and sensory characteristics of products fried in high-oleic, low-linolenic rapeseed oil, Matthäus, B., N.U. Haase, and G. Unbehend
- Scale-up of enzyme-assisted aqueous extraction processing of soybeans, de Moura, J.M.L.N., N.M. de Almeida, and L.A. Johnson
- Effect of hydrothermal treatment of rapeseed on antioxidant capacity of the pressed rapeseed oil, Szydłowska-Czerniak, A., G. Karlovits, Á. Sosna-Sárdi, C. Dianoczki, and E. Szłyk

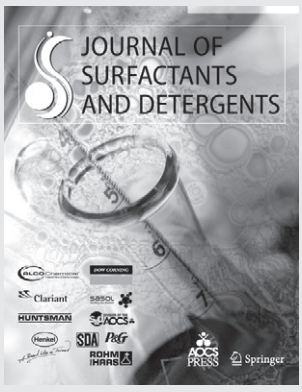


Lipids (August)

- Docosahexaenoic acid activates some SREBP-2 targets independent of cholesterol and ER stress in SW620 colon cancer cells, Størvold, G.L., K.G. Fleten, C.G. Olsen, T. Follestad, H.E. Krokan, and S.A. Schønberg
- Artificial rearing of infant mice leads to n-3 fatty acid deficiency in cardiac, neural, and peripheral tissues, Hussein, N., I. Fedorova, T. Moriguchi, K. Hamazaki, H.-Y. Kim, J. Hoshiba, and N. Salem
- Involvement of lipids in dimethoate-induced inhibition of testosterone biosynthesis in rat interstitial cells, Astiz, M., G.E.H. de Catalfo, M.J.T. de Alaniz, and C.A. Marra
- Association of ER-alpha gene polymorphism with metabolic phenotypes in

Chinese Hans, Chen, Y., X.-y. Jiang, L. Xu, X. Li, F.-f. Cao, L. Li, M. Lu, L. Jin, and X.-f. Wang

- Characterization of mutant serine palmitoyltransferase 1 in LY-B cells, Momin, A.A., H. Park, J.C. Allegood, M. Leipelt, S.L. Kelly, A.H. Merrill, and K. Hanada
- The HMG-CoA reductase gene and lipid and lipoprotein levels: The multiethnic study of atherosclerosis, Chen, Y.-C., Y.-D.I. Chen, X. Li, W. Post, D. Herrington, J.F. Polak, J.I. Rotter, and K.D. Taylor
- Metabolites from an endophytic fungus *Sphaceloma* sp. LN-15 isolated from the leaves of *Melia azedarach*, Zhang, A.-L., L.-Y. He, J.-M. Gao, X. Xu, S.-Q. Li, M.-S. Bai, and J.-C. Qin
- Overexpression of a FAD3 desaturase increases synthesis of a polymethylene-interrupted dienoic fatty acid in seeds of *Arabidopsis thaliana* L., Puttick, D., M. Dauk, S. Lozinsky, and M.A. Smith
- An isomeric mixture of novel cerebrosides isolated from *Impatiens pritzellii* reduces lipopolysaccharide-induced release of IL-18 from human peripheral blood mononuclear cells, Zhou, X., L. Tang, and Y. Liu
- Development of a high-density assay for long-chain fatty acyl-CoA elongases, Kitazawa, H., Y. Miyamoto, K. Shimamura, A. Nagumo, and S. Tokita



Journal of Surfactants and Detergents (Issue 3)

- The interfacial tension between cationic gemini surfactant solution and crude oil, Han, L., Z. Ye, H. Chen, and P. Luo
- Design of experiments to evaluate the detergency of surfactants on fatty soils in a continuous-flow device, Alameda, E.J., V.B. Rodríguez, J.N. Olea, R.B. Moreno, A.G. Borrego, and D.A. Vaz
- Bifunctional *N*-oxides of alkyldiamidoamines, Piasecki, A., B. Wójcik, J. Łuczyński, D. Piłakowska-Pietras, S. Witek, and A. Krasowska
- Solubilization and adsolubilization of polar and nonpolar organic solutes by linker molecules and extended surfactants, Charoensaeng, A., D.A. Sabatini, and S. Khaodhiar
- A rheological approach to viscoelastic worm-like micelles of tunable properties, Parathakkatt, S., J. George, M.S. Sajeev, and L. Sreejith
- Microscopy study of distribution of laundry fabric softener on cotton fabric, Obendorf, S.K., V. Dixit, and D.J. Woo
- Aggregation of alcohols ethoxylates in *n*-heptane, Gárate, J.A., M. de los Ángeles Valenzuela, M.P. Gárate, and A.F. Olea
- Pure *N*-alkylaminopropionic acid and *N*-alkylaminodipropionic acid sodium salts: Synthesis, characterization, and physicochemical properties, Bettayeb, B., C. Descôteaux, F. Benoit, C. Chapados, and G. Bérubé
- Synthesis and properties of gemini-type cationic surfactants containing carbonate linkages in the linker moiety directed toward green and sustainable chemistry, Banno, T., K. Toshima, K. Kawada, and S. Matsumura
- Microwave-assisted synthesis and properties of a novel cationic gemini surfactant with the hydrophenanthrene structure, Jia, W., X. Rao, Z. Song, and S. Shang
- Synthesis and properties of lipoamino acid–fatty acid mixtures: Influence of the amphiphilic structure, Rondel, C., I. Alric, Z. Mouloungui, J.-F. Blanco, and F. Silvestre
- Characterization of microemulsion systems formed by a mixed 1,3-dioxolane ethoxylate/octyl glucoside surfactant system, Alkhatib, M.H., D.G. Hayes, and V.S. Urban

bands, especially on the intensity ratio of the *cis* (=C—H) and *cis* (C=C) bonds normalized by the band at 1441 cm^{-1} (CH_2), was established to authenticate genuine/fake olive oil. These intensity ratios of the vibration bands given in the form of a two-dimensional chart allow first the discrimination between the various grades of olive oil and the seed oils and then the detection of olive oil fraud by the line of $y = 0.7$, which is observed under most experiments and dot charts. This method can reliably distinguish the genuine olive oils from the olive oils containing 5% (volume percentage) or more of other edible oils, such as soybean oil, rapeseed oil, sunflowerseed oil, or corn oil. Compared with the traditional principal component analysis method, this method is more intuitive, more precise, and easier to use. Moreover, this method also has the advantages of simplicity and efficiency and has no need for sample preprocessing, being especially suitable for onsite testing in field applications.

Investigation of natural phosphatidylcholine sources: Separation and identification by liquid chromatography–electrospray ionization–tandem mass spectrometry (LC–ESI–MS^2) of molecular species

Le Grandois, J., E. Marchioni, M. Zhao, F. Giuffrida, S. Ennahar, and F. Bindler, *J. Agric. Food Chem. 57*:6014–6020, 2009.

This study is a contribution to the exploration of natural phospholipid (PL) sources rich in long-chain polyunsaturated fatty acids (LC-PUFA) with nutritional interest. Phosphatidylcholines (PC) were purified from total lipid extracts of different food matrices, and their molecular species were separated and identified by liquid chromatography–electrospray ionization–tandem mass spectrometry (LC-ESI–MS^2). Fragmentation of lithiated adducts allowed for the identification of fatty acids linked to the glycerol backbone. Soy PC was particularly rich in species containing essential fatty acids, such as (18:2–18:2)PC (34.0%), (16:0–18:2)PC (20.8%), and (18:1–18:2)PC (16.3%). PC from animal sources (ox liver and egg yolk) contained major molecular species, such as (16:0–18:2)PC, (16:0–18:1) PC, (18:0–18:2)PC, or (18:0–18:1)PC.

Finally, a marine source (krill oil), which was particularly rich in (16:0–20:5)PC and (16:0–22:6)PC, appeared to be an interesting potential source for food supplementation with LC-PUFA–PL, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

A green process for producing biodiesel from feather meal

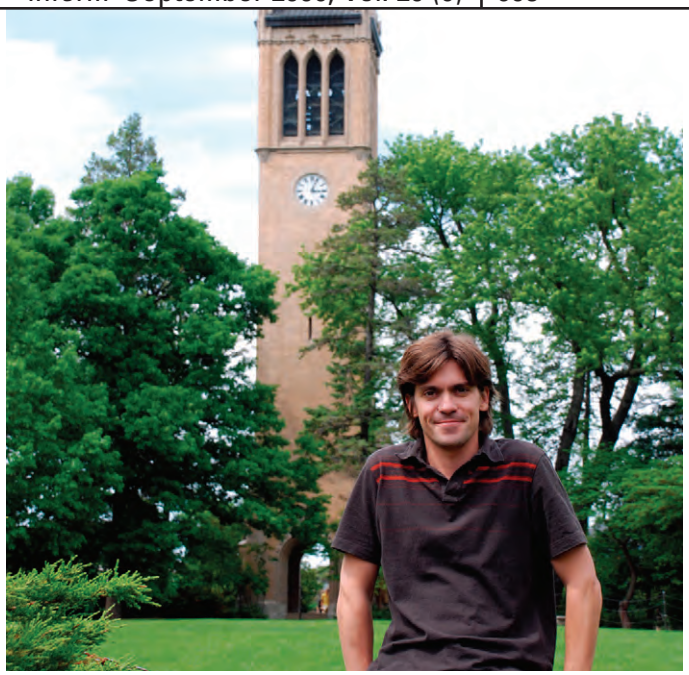
Kondamudi, N., J. Strull, M. Misra, and S.K. Mohapatra, *J. Agric. Food Chem. 57*:6163–6166, 2009.

This paper describes a new and environmentally friendly process for developing biodiesel from commercial feather meal, a waste product of the poultry industry. Currently, feather meal is used as an animal feed, given its high protein content, and also as a fertilizer because of its high nitrogen content. In this work, we have extracted fat from the feather meal in boiling water (70°C) and then transesterified the fat into biodiesel using KOH and methanol; 7–11% biodiesel (on a dry basis) is produced in this process. ASTM analysis of the prepared feather meal biodiesel confirmed that the biodiesel is of good quality and comparable with other biodiesels made from other common feedstocks. Given the amount of feather meal produced by the poultry industry, it is estimated that this process can create 150–200 million gallons (570–760 million liters) of biodiesel in the United States and 593.2 million gallons (2.2 billion liters) worldwide.

Increase in nutritionally important sweet corn kernel carotenoids following mesotrione and atrazine applications

Kopsell, D.A., G.R. Armel, T.C. Mueller, C.E. Sams, D.E. Deyton, J.S. McElroy, and D.E. Kopsell, *J. Agric. Food Chem. 57*:6362–6368, 2009.

The herbicide mesotrione inhibits a critical enzyme, phytoene desaturase, in plant carotenoid biosynthesis. Mesotrione is currently labeled for selective weed control in sweet corn (*Zea mays* var. *rugosa*). Mesotrione applied alone, or in mixtures with the photosystem II inhibitor atrazine, acted to increase concentrations of kernel antheraxanthin, lutein, and zeaxanthin carotenoids in several sweet corn genotypes. Kernel lutein and zeaxanthin levels significantly increased 15.6% after mesotrione + atrazine early post-emergence applications, as compared with the control treatment. It appears that mesotrione applications resulted in greater pools of kernel carotenoids once the sweet corn genotypes expressing moderate injury overcame the initial herbicidal photo-oxidative stress. This is the first report of herbicides directly up-regulating the carotenoid biosynthetic pathway in corn kernels, which is associated with the nutritional quality of sweet corn. Enhanced accumulation of lutein and zeaxanthin is important because dietary carotenoids function in suppressing aging eye diseases such as macular degeneration, now affecting 1.75 million older Americans. ■



Meet Jose Gerde

Jose Gerde, a 2009 AOCS Honored Student, first encountered lipids research when he was finishing his B.S. in Argentina (where he is from) and came to Iowa State University in Ames (ISU; USA) for a summer internship.

"I worked in Pam White's lab on a frying project for two months," he remembers. "After my return to Argentina, we stayed in touch and I decided to come back to ISU for grad school to work on an oils project. I did my master's with Dr. White as my major professor doing research on the stability of soybean oils with modified fatty acid compositions. After graduation, I worked for a few months for Dr. Larry Johnson on a protein functionality project, and finally I started my Ph.D. with both Drs. White and Johnson as my co-major professors," Gerde says.

He currently is working with both White and Earl Hammond on a project involving antipolymerization agents for oils subjected to high temperatures, studying the protective mechanism of polydimethylsiloxane in frying oils.

Gerde hopes to graduate by the second or third quarter of 2010 and would like eventually to return to Argentina to be a professor. Before that, however, he would like to gain some postdoctoral experience in order to add to his research experiences, "especially doing more grant writing, managing research projects, and writing and publishing manuscripts," he says.

Gerde reports that he has always been interested in science in general and chemistry in particular. "When I was eight years old," he says, "my parents gave a chemistry game with which I started mixing things and doing some basic experiments like making carbonated water."

Away from the laboratory, Gerde likes to play tennis, ski, socialize (he is involved in the Argentine, Uruguayan, and Chilean Students' Association at ISU), read, and travel.

"Studying at Iowa State has been a great experience that exposed me to people from many different cultures and fields and has given me the opportunity to become part of AOCS, where I have made good friends and met colleagues from around the world," he says.

Announcement

AOCS 100 Years 1909–2009

Your Global Fats and Oils Connection

Preliminary Slate for 2010–2011 AOCS Governing Board Election

The following preliminary slate of candidates has been developed by the Nominations & Election Committee and approved by the AOCS Governing Board.

President:
Keith Grime
Vice President:
Erich Dumelin v. Carlos Molina
Secretary:
Sevim Erhan v. Neil Widlak
Members-at-Large
(four positions to be filled):
Rich Barton
Doug Bibus
David Duncan
Mila Hojilla-Evangelista
Alejandro Marangoni
Mike Snow
Dan Solaiman
Manfred Trautmann

Changes to the AOCS By-Laws and Articles of Incorporation now allow the membership to nominate up to four additional member-at-large candidates by petition. Petitioned candidates receiving at least 50 AOCS member signatures will be added to the ballot approved by the Governing Board. Preference will be given to the first four petitioned candidates meeting the eligibility requirements as outlined here. Petitioned nominations must be received at the AOCS Headquarters no later than **October 30, 2009**.

Petition forms can be obtained by visiting www.aocs.org/about/nominationform.pdf. Please send completed petitions with at least 50 AOCS member signatures to:

AOCS Nominations & Elections Committee
P.O. Box 17190
Urbana, IL 61803-7190 USA

Or fax to:
Attn: Amy Lydic
+1-217-351-8091

Each year the AOCS and its component groups present awards to recognize accomplishments by individuals in the realm of fats, oil, and related materials.

CALL FOR NO

A. Richard Baldwin Distinguished Service

This is the Society's highest service award. It recognizes long-term, distinguished service to the AOCS in positions of significant responsibility.

Nature of the Award: $2,000, a travel-and-expense allowance, and a plaque provided by Cargill.

Deadline: November 1

AOCS Award of Merit

This award recognizes productive service to the AOCS: leadership in committee activities; service that has advanced the Society's prestige, standing, or interests; and, service not otherwise specifically recognized.

Nature of the Award: A plaque.

Deadline: November 1

AOCS Fellow

The status of Fellow is awarded to members of the AOCS whose achievements in science entitle them to exceptionally important recognition or to those who have rendered unusually important service to the Society or to the profession.

Nature of the Award: Fellow membership status and a plaque.

Deadline: December 1

AOCS Young Scientist Research Award

This award recognizes a young scientist who has made a significant and substantial research contribution in one of the areas represented by the Divisions of the AOCS.

Nature of the Award: $1,000 honorarium, a plaque, and a travel-and-expense allowance provided by the International Food Science Center A/S.

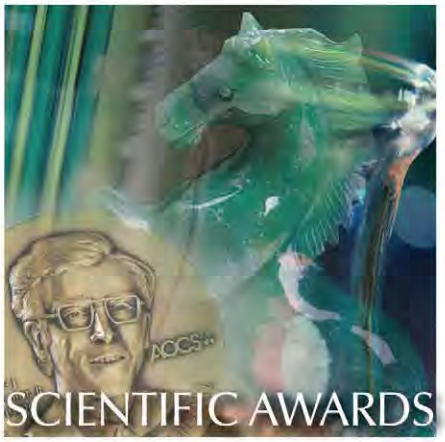
Deadline: November 1

Corporate Achievement Award

This award recognizes industry achievement for an outstanding process, product, or contribution that has made the greatest impact on its industry segment.

Nature of the Award: A plaque.

Deadline: November 1



Supelco/Nicholas Pelick-AOCS Research Award

This award recognizes outstanding original research of fats, oils, lipid chemistry, or biochemistry. The recipient must have published the research results in high-quality technical papers regarding fats, oils, lipid chemistry, or biochemistry.

Nature of the Award: $10,000 honorarium, a travel-and-expense allowance, and a plaque. The award is sponsored by Supelco, a subsidiary of Sigma Aldrich Corp, and Nicholas Pelick, past president of AOCS.

Deadline: November 1

Stephen S. Chang Award

This award recognizes a scientist, technologist, or engineer whose distinguished accomplishments in basic research have been used by industries for the improvement or development of products related to lipids.

Nature of the Award: An honorarium and a jade galloping horse, symbolizing the award, provided by the Stephen and Lucy Chang endowed fund.

Deadline: October 15

The Schroepfer Medal

Originated by colleagues of George Schroepfer, this award recognizes a scientist who has made significant and distinguished advances in the steroid field. The work may represent a single major achievement or an accumulation of data.

Nature of the Award: An honorarium and a medal.

Deadline: October 15

SDA/NBB Glycerine Innovation Award

The Industrial Oil Products Division of the AOCS initiated this award to recognize outstanding achievement for research in new applications for glycerine with particular emphasis on commercial viability.

Nature of the Award: $5,000 honorarium and a plaque provided by The Soap and Detergent Association and the National Biodiesel Board.

Deadline: November 1

Biotechnology Division Lifetime Achievement Award

The Biotechnology Division of the AOCS initiated this award to recognize an individual who has made significant and meritorious lifetime achievements in areas of interest to the Biotechnology Division.

Nature of the Award: $3,500 honorarium and a plaque.

Deadline: November 1

USB Industrial Uses of Soybean Oil Award

The Industrial Oil Products Division of the AOCS initiated this award to recognize outstanding research into new idustrial applications or uses for soybean oil.

Nature of the Award: $3,000 honorarium and a plaque provided by the United Soybean Board.

Deadline: November 1

CALL FOR NOMINATIONS

Each award has its own specific and unique nomination requirements. For award consideration, it is essential that all paperwork be complete and received at AOCS by the nomination deadline. Self-nominations are welcomed and encouraged. Please refer to the website for the nomination requirements and submission deadlines.

ELECTRONIC SUBMISSIONS ONLY!

AOCS is accepting nomination material only by electronic communication. Window based programs (WORD) and PDF material emailed to AOCS must include the award name and candidate name in the email subject line. For complete information and entry details on all awards, please visit the AOCS Awards Program website **www.aocs.org/member/awards**.

OMINATIONS

Award recipients range from longtime AOCS members who have spent years in their specialties to graduate students who are just beginning their careers.

Samuel Rosen Memorial Award

Milton Rosen and the Surfactants and Detergents Division of the AOCS initiated this award to recognize a surfactant chemist for significant advancement or application of surfactant chemistry principles.

Nature of the Award: $2,000 honorarium and a plaque provided by the endowed fund.

Deadline: November 1

Food Structure and Functionality Division Lifetime Achievement Award

The Food Structure & Functionality Division of the AOCS initiated this award to honor outstanding lifetime performance and meritorious contributions to an area of interest to the Food Structure & Functionality Division.

Nature of the Award: $1,500 travel-and expense allowance and a crystal plaque.

Deadline: November 1

Herbert J. Dutton Award

The Analytical Division of the AOCS initiated this award to recognize an individual who has made significant contributions to the analysis of fats and oils and related products or whose work has resulted in major advances in the understanding of processes utilized in the fats and oils industry.

Nature of the Award: $1,000 honorarium and a plaque.

Deadline: November 1

Timothy L. Mounts Award

The Edible Applications Technology Division of the AOCS initiated this award to recognize research relating to the science and technology of edible oils or derivatives in food products, which may be basic or applied in nature.

Nature of the Award: $500 honorarium and a plaque provided by Bunge North America.

Deadline: November 1

Alton E. Bailey Award

This award is supported by the North Central Chapter of the USA Section and recognizes research and/or service in the fields of fats and oils and related disciplines.

Nature of the Award: An honorarium and a plaque. The award recipient must present an award lecture at the Section's meeting, or the Society's Annual Meeting.

Deadline: November 1

Thomas H. Smouse Fellowship Award

This award was established by the Archer Daniels Midland Foundation and the family and friends of Thomas H. Smouse. The purpose of this graduate fellowship is to encourage and support outstanding research by recognizing a graduate student pursuing an M.S. and/or Ph.D. degree in a field of study consistent with the areas of interest of the AOCS.

Nature of the Award: The Fellowship level is up to $15,000 ($10,000 Fellowship, $5,000 for travel and research expenditures related to the student's graduate program).

Deadline: February 1

Ralph H. Potts Memorial Fellowship

This award recognizes a graduate student working in the field of chemistry of fats and oils and their derivatives. Qualifying research will involve fatty acids and their derivatives, such as long-chain alcohols, amines, and other nitrogen compounds.

Nature of the Award: $2,000 honorarium, a plaque, and travel-and-expense allowance. The award is supported by AkzoNobel, Inc.

Deadline: October 15

Honored Student Award

This award recognizes graduate students in any area of fats and lipids. To receive the award, a candidate must remain a registered graduate student and must not have received a graduate degree or have begun career employment prior to the Society's Annual Meeting.

Nature of the Award: Travel-and-expense allowance to attend and present a lecture at the Society's Annual Meeting.

Deadline: October 15

Kalustian and Manuchehr Eijadi Awards

Each award recognizes outstanding merit and performance of one Honored Student award recipient and includes an honorarium of $1,000.

Hans Kaunitz Award

This award is supported by the Northeast Chapter of the USA Section and encourages studies in the sciences relating to fats, oils, and detergent technology. This award is open to graduate students within the geographical boundaries of the Northeast Chapter of the USA Section.

Nature of the Award: Travel-and-expense allowance to attend and present at the Society's Annual Meeting, and a certificate.

Deadline: February 1

AOCS Division Awards for Students

These awards recognize students at any institution of higher learning, who are studying and doing research towards an advanced degree in fats, oils, proteins, lipids, surfactants, detergents, and related materials.

The following student awards are currently being offered by these AOCS Divisions:

- Analytical Division Student Award
- Biotechnology Student Excellence Award
- Edible Applications Technology Division Student Award
- Health and Nutrition Division Student Excellence Award
- Industrial Oil Products Division Student Award
- Processing Division Student Excellence Award
- Surfactants and Detergents Division Student Travel Award

Nature of the Award: Awards can consist of up to $500 to help defray travel and lodging costs to attend the Society's Annual Meeting to give a technical presentation.

Deadline: Varies from October 15 to January 15

The award recipient must agree to attend the AOCS Annual Meeting & Expo and present an award address. The AOCS Annual Meeting & Expo will be held in Phoenix, Arizona, USA from May 16–19, 2010.

AOCS Awards contact

Email: awards@aocs.org • **Web:** www.aocs.org/member/awards

The Cooperativa Obrera:
An example in promoting good nutrition

Eduardo Dubinsky

On the morning of September 12, 2001, newspapers in Bahía Blanca (one of the main cities of Buenos Aires Province, Argentina), as in every city of the world, covered the terrorist attack against the World Trade Center in New York City. Not surprisingly, the full-page advertisement that same day about the launching of a healthful bread made with omega-3-containing canola oil was likely overlooked by most of the paper's readers. This introduction occurred approximately three months before Argentina fell into what was perhaps the worst economic and political crisis of its history. Even though it was clearly not an ideal moment for promoting healthful eating, the team in charge of the Healthy Foods Program of the Cooperativa Obrera (CO; Spanish for "Worker's Cooperative") didn't give up its project of improving the nutrition profile for their members.

WHAT IS THE CO?

With its 720,000 members, the CO is the second-largest Latin America Consumers' Cooperative, after Coop in Brazil. Counting its hypermarkets, supermarkets, and drugstores, the CO has 77 outlets in 131 towns and four provinces, all in an area of 1.2 million inhabitants. It is one of the top 10 supermarket chains in the country, with annual revenues of about $270 million.

THE HEALTHY FOODS PROGRAM

According to the seventh principle of the cooperativism the activity of the cooperative should be focused on the community: Consumers' health and environmental protection are the main ways to accomplish these goals.

The CO was founded in 1920 by 173 railway workers as a bakery. Because of the CO's relationship to bread from its beginning, it chose to start its Healthy Foods Program eight years ago by supplementing bread with omega-3 (from canola oil). The CO initially absorbed the extra cost involved to promote the bread's consumption among both its members and the population in general.

FIG. 1. *Advertisement for several healthful foods offered at a special discount rate.*

As it won market share, the project's sustainability encouraged the CO to continue on a road toward healthful nutrition. It developed a large variety of functional and healthful foods, supplementing products with vegetable oil containing healthful unsaturated fatty acids (omega-3, -6, and -9). Many of the products were manufactured in its own facilities, which included bakeries, delis, and meat processors. Bread, sausages, and pasta are examples of some of its products (Fig. 1).

In an extensive article explaining the Healthy Foods Program, the CO describes the three elements that currently contribute to an inadequate diet:

- Social aspects: People who cannot afford food that is nutritionally adequate;
- Personal aspects: People who are able to afford healthful foods but have acquired bad nutrition habits;
- Manufacturing aspects: Companies involved in food production, distribution, or commercialization that do not consider the negative effects of their products.

During the past several years, consumer awareness of the importance of good nutrition for healthful living has risen. Because it believes that this trend will continue to grow, the CO has formulated a policy that includes a wider portfolio of healthful products and a strong effort to educate consumers.

The CO plans to accomplish these goals by:

- Providing information on good and healthful nutrition to support messages addressed to consumers; forming alliances with nongovernmental organizations (NGO), medical schools, and foundations dedicated to disease prevention; and using CO channels to play a leading role in spreading the basics of healthful nutrition;

- Training store managers and employees so that they can act as nutrition advisors, imparting basic knowledge to guide consumers;
- Offering tailor-made products, manufactured either by the CO or third parties, focused on a more healthful profile.

SOME FATS AND OILS EXAMPLES

Fats and oils are at the core of the CO's Healthy Foods Program. As mentioned above, the CO started in 2001 by supplementing bread with canola oil to improve the balance of omega-3 fatty acids in the diet. Then it introduced high-oleic sunflower oil in 2002. At that time, the author of this article was leading (as external consultant for Dow Agrosciences) the processing of high-oleic sunflower oil and its application for the replacement of *trans* fats. As a result this oil was introduced in Argentina.

This product—launched for sale as a 1-liter PET (polyethylene terephthalate) bottle bearing the Ecoop brand (the umbrella brand for CO healthful foods; Fig. 2)—was aimed at (and has largely succeeded in) replacing *trans* fats in the food industry and foodservice. But after the country's deep economic crisis in 2001, new developments in the industry were focused on cheaper foods; it was difficult to spur food companies' interest in more healthful and expensive foods.

As CO knew that high-oleic sunflower oil was available and could be a good alternative to *trans* fats in some bakery and frying products, they contributed to the switch by putting pressure on their own suppliers, for the CO-branded foods, and also on some of the companies that produce foodstuffs bearing the most popular brands in Argentina, such as Granix (crackers and biscuits) and Fargo (industrially wrapped sliced bread), among others. An additional achievement of the CO came in its supplementation of many bakery products with phytosterols, which are recognized to have a powerful effect on cholesterol and cardiovascular disease reduction.

FIG. 2. *Advertisement for high-oleic sunflower oil.*

CONSUMER EDUCATION IN ACTION

Working together with PROPIA (Program for Prevention of Infarcts in Argentina), an NGO that depends on the National University of La Plata's School of Medicine, the CO developed many activities for the education of consumers and the population.

It developed consumers groups (circulos de consumidores, in Spanish) in almost all the towns where it was present; these groups hold regular local meetings and attendees are informed about important nutrition facts. Every year the CO sponsors a Consumers' Groups Meeting at the CO-owned shopping mall in Bahía Blanca (Buenos Aires, Argentina; also the site of CO headquarters),

with more than 1,200 attendees from 50 cities and towns. The author of the article has been invited to these meetings as a lecturer and was particularly amazed by the 2nd Regional Consumers' Convention in 2003, both for the number of attendees and the level of their participation. Participants could hear presentations on issues such as *trans* fats, omega-3 fatty acids, and labeling, and developed an overall awareness of the most important tips for choosing the right food with the right fats (Fig. 3).

The CO also publishes a magazine called *Family Cooperative* that provides valuable information on new products and nutrition trends, and has a radio station that broadcasts nutrition news.

The CO has developed an intervention program in the small town of Cabildo in the Buenos Aires province, inspired by the successful North Karelia program of Finland developed by Peka Pushka in the 1980s. They took advantage of being the exclusive supplier of foodstuffs in that community, developing many programs not only on nutrition but also on physical activity and policies against smoking. At present they are evaluating, after four years, the effects of the intervention program on the health of the people. These results could be a valuable tool for adopting similar programs in other towns and cities of the country.

ENVIRONMENTAL PROTECTION

The CO has been working also in another aspect linked with community wellness: environmental protection. Its goals are:

- Reduction of garbage generation;
- Promotion of recycling;
- Reduction of unnecessary packaging.

One of the CO's main actions involved starting a project to collect used frying oil from the kitchens and the food shops, or court, in the Bahía Blanca Plaza Shopping Mall, for recycling and transformation into biodiesel. They named this fuel "E-COOP."

The industrial process is performed in a school of the city of Tres Arroyos. Part of the biodiesel is used in the vehicles that transport their students from rural areas, and the balance is returned to the CO to be used in one of its vehicles. In this way, used oil is turned into clean and renewable energy, avoiding the environmental impact that could be generated by soil and water contamination related to improper waste disposal.

ADHERENCE TO WHO AND PAHO GUIDELINES

The CO strongly supports the strategy of the WHO (World Health Organization) and the PAHO (Pan American Health Organization) regarding nutrition, physical activity, and tabaquism (smoking addiction). It also participated as a speaker in the meeting organized by PAHO: *Trans* Fat Free Americas in Rio (Brazil) in June 2008. During the Consumer Circles Convention of 2006 and 2007 the convention participants approved the WHO and PAHO guidelines toward a healthier nutrition profile.

FIG. 3. *Attendees at the Cooperativa Obrera's 2nd Regional Consumers Convention, held in 2003 in Bahía Blanca (Buenos Aires, Argentina).*

IMPROVING LIFE

During the last decade, especially in the last five years, a most dramatic change in the fats and oils profile of foods has taken place. These changes have mainly been due to the final consensus on *trans* fatty acids' deleterious effect on health. Another issue has been the food pyramid that had guided the food industry until 2004, when it was shown to contain certain misconceptions. (E.g., the previous USDA food pyramid, adopted by many food companies in their food packaging, established that all carbohydrates are healthful and made a recommendation for the consumption of several servings a day. Additionally, the pyramid cast all fats as nonhealthful and recommended the consumption of very few servings per day. This was changed in 2004 by differentiating whole grain products from refined products in carbohydrates and unsaturated oils [healthful] from saturated and *trans* fats.) These misconceptions contributed to the increase of health problems such as obesity, type-2 diabetes, and metabolic syndrome, which are currently considered as major consequences (among others) of poor nutrition.

For many years, the food and fats and oils industries have had a reactive attitude toward these scientific findings; eventually, though, they started to find creative alternatives that would allow them to choose the right fat for most food applications. During the first years of this decade, many people were skeptical and reluctant about such changes, especially when it came to the consumers' understanding of the complex issues involved in guidelines and labeling. The CO stands as an example of a group that embraced these changes and found, through consistency, that it was able to arrive at better solutions for diet, overall lifestyle, and environmental protection—for both this generation and those to come.

information

- For more information on the Cooperativa Obrera, visit: www.cooperativaobrera.com.ar/index.htm (available only in Spanish).
- For complete information on the World Health Organization (WHO) documents, visit: www.who.int/dietphysicalactivity/strategy/eb11344/en/.
- For information on the Pan American Health Organization (PAHO) program: Trans Fat Free Americas], see *inform* 19:711–712, 2008.

inform *Contributing Editor Eduardo Dubinsky, of Eng.E.Dubinsky & Assoc.–Technical Consultants (Buenos Aires, Argentina), can be reached via e-mail at edubinsky@ciudad.com.ar.* *He would like to thank Enrique Moreno and Brian Chaz from the Environment, Culture and Community Actions Department of the CO for the information and pictures provided for this article.*

AM&E Hot Topic

Genomics and biotechnology are revolutionizing soybean productivity and product quality

Editor's note: This article was originally published in the United Soybean Board's Soy Connection e-newsletter. For a free subscription, please visit www.soyconnection.com.

Richard F. Wilson

Over the past few years, we have heard a great deal about the benefits from research on the human genome. Similar efforts are underway to establish the order of genes in crop genomes, such as the soybean. Now that scientists have sequenced the DNA in the entire soybean genome and have developed sophisticated tools for gene discovery, we need to explain how these revelations will benefit consumers.

A step in that process was taken at the 100th AOCS Annual Meeting & Expo (Orlando, Florida, USA), when the United Soybean Board (USB) sponsored the special Hot Topic symposium, "How Genomics and Biotechnology are Revolutionizing Soybean Productivity & Quality." This symposium helped promote an awareness of the renaissance in soybean genetics that has come about by achieving the full DNA sequence of the soybean genome and of what that scientific breakthrough means to consumers, producers, processors, and manufacturers.

We typically expect advances in soybean genomics and biotechnology to enable quantum leaps in productivity and ability to protect against crop loss, which will undoubtedly happen. However, unlocking the secrets of the soybean genome has also accelerated the development of a number of quality traits that will soon become available in a wide range of food and feed products. This symposium demonstrated how that technology can meet the increasingly complex demands from both the food and feed industries.

Speakers included: Andrew Rude, international trade specialist, Office of Scientific & Technical Affairs, US Department of Agricuture (USDA), Foreign Agricultural Service; David Hyten and Michelle Graham, research geneticists, USDA, Agricultural Research Service; Monica Schmidt, domain member, Donald Danforth Plant Science Center; Roger Boerma, distinguished professor, Plant Breeding & Genomics, University of Georgia-Athens; Ernest Sanders, senior scientist, Monsanto Co.; Steve Schnebly, senior research manager, Pioneer/Dupont; and myself.

From my own perspective, it is gratifying to look back on how far soybean research has come in the past five years, and exciting to think about what the future holds. However, no matter how accomplished geneticists might become within their own realm, there always is room to improve, especially when it comes to interfacing with the beneficiaries of the technology they develop.

Understanding the perspectives of multiple links in the value chain helps ensure that the research strategies scientists undertake are relevant to stakeholder and consumer needs. In that regard, USB, through the US soybean checkoff and QUALISOY™, a collaborative initiative representing all interests in the soybean value-chain, have been instrumental in supporting efforts to accelerate the development and commercialization of enhanced soybean traits.

USB keeps abreast of consumer attitudes and sponsors research to identify and address industry needs. For example, every two years, USB convenes the CONNECTIONS workshop to identify or reaffirm relevant issues for the soybean checkoff. Stakeholder input is then used to update the USB long-range strategic plan. The top three priorities from the CONNECTIONS workshop held in December 2008 focused on:

- Enhanced soybean yield plus improved product quality,
- Soy products that help sustain domestic livestock production, and
- Market access for US soybeans, primarily for biotech traits.

Soybean geneticists recognize the importance of these research objectives. But, more needs to be done to communicate the significance of these priorities to the public. I find that an analysis of USDA statistics is a good place to start. For example, the world soybean supply is on an upward trend, approaching the 300 million metric ton (MMT) level. The slope of this trend is accelerating at about 11 MMT/yr. Soybean use has tracked evenly with supply.

On average, the world consumes about 95% of the total soybean supply, leaving an average annual carryover sufficient for about 70 days, a rather small amount to share among the 6.8 billion people on Earth. The linear upward trend suggests that consumer demand for soybeans is limited by availability. Conversely, any disaster that might befall soybean production also could cause a severe food shortage. There are too many hungry people, as well as too many hungry pigs, chickens, and fish, in the world to let that happen.

Yield and land are the obvious factors that determine the volume of soybean production. Worldwide, soybean harvested area has expanded at about 2.7 million hectares (4 million acres) per year. However, soybean acreage in the United States appears to have reached capacity, and may decline depending on how much corn is planted. In addition, recent data indicate an apparent plateau in soybean production area abroad. This is another troublesome

Hear Richard Wilson discuss this Hot Topic by visiting www.aocs.org/meetings/annual_mtg/index.cfm?page=am09_ht_genomics.htm and clicking on the audio mp3 link.

observation. It may be temporary, but what if it persists?

On the basis of current rates calculated by simple regression analysis, world soybean production may reach about 330 MMT by 2020. If one assumes an expansion from 240 to 325 million harvested acres of soybean by 2020, it should take an average 37.3 bushels per acre (bu/A), or 2.5 metric tons/hectare, to achieve the 330 MMT goal. That's only a 5% increase above the world yield average for 2008. However, if there is no further increase in land, average global soybean yields would have to increase from 36 to about 51 bu/A to produce 330 MMT. That's roughly a 42% increase in soybean yield in the next decade, a very tall order for conventional or classical breeding methods.

Where can we expect this yield increase to come from? Based on current trends for land and production, projections suggest the United States will get a little help from Brazil, Argentina, and other soybean-producing countries in improving soybean yields. At the current rate of gain, we can project an average yield of 46 bu/A for the United States by 2020.

However, that may not be enough. If there is no further increase in land worldwide, the US average in 2020 would have to double (into the 80 bu/A range) to get to 330 MMT. While some farmers in Missouri consistently raise 100+ bu/A soybeans, until yields that high are commonplace throughout the United States, economists will continue to question whether conventional breeding for yield will sustain long-term linear growth in world soybean production.

On the other hand, soybean research is in a very good position to meet this challenge, due to a better understanding of the soybean genome and superior biotechnologies. Strength in soybean genomics and biotechnology also enables a timely response to governmental actions that impact the US soybean industry.

For example, the Food and Drug Administration Final Rule on *Trans Fatty Acids in Nutrition Labeling* brought attention to the level of *trans* fat in partially hydrogenated vegetable oils, as a means to protect consumer health. Before this rule, about half of the soybean oil consumed in the United States was hydrogenated to some degree (approximately 8.5 billion lbs/year). As a result of this mandatory requirement and the associated publicity on *trans* fat, total US soybean oil consumption has dropped by 14% (approximately 2.5 billion lbs).

Fortunately, advances in genomics and biotechnology have helped the US soybean industry address consumer interest in reducing dietary *trans* fat by aggressively developing and commercializing soybeans with enhanced compositional traits. Low-linolenic soybean oil was the first of these products to become commercially available.

History may show that the launch of low-linolenic soybean oil was a major turning point for the US soybean industry. So far, low-linolenic soy has helped recapture about 1 billion pounds of the market lost to competing oils at a time when food companies were seeking alternatives to partially hydrogenated soybean oil.

Low-linolenic soybean oil has also helped develop a production and market infrastructure that facilitates commercialization of other innovations in soybean quality. Thus, low-linolenic soy is a first step on the way to improved products for health-conscious consumers who will also be interested in the next generation of products such as soybean oil with mid- to high-oleic acid concentration.

High-oleic soybean oil is entering commercial production, soon to be followed by oil with a mid-oleic plus low-saturated fatty acid composition. Even without more legislation on hydrogenation, USDA data and QUALISOY estimates show that these modified soybean oils could achieve a 40% share of total domestic soybean oil consumption (estimated at approximately 23.5 billion pounds, or 10.7 MMT) by 2020, possibly more.

The second-highest priority from the CONNECTIONS workshop focused on the US livestock industry, since virtually all US soybean meal is used in feed products. However, poultry, pig, and aquaculture operations face a dilemma. Because of high feed costs, they are experimenting with distiller dried grains, synthetic amino acids, and cheaper forms of carbohydrate and fat, but they don't wish to sacrifice meat quality in the process. In response, a school of thought is emerging in the animal sciences on the benefits of customized dietary intervention to preempt enteric disease, improve feeding efficiency, increase nutrient absorption, and reduce mortality in livestock production.

This appears to be a mutually beneficial match for soybean genomic and biotechnologies on quality traits that help improve livestock performance, mitigate problems with livestock waste, decrease volatile emissions, and help reduce nonmedical use of antibiotics. Thereby, genetic advances in soybean quality should help sustain domestic livestock production with cost-effective ways to protect the environment and improve human and animal health.

The third priority from the CONNECTIONS workshop related primarily to market barriers to US soybeans. Last year, 92% of the soybeans produced in the United States contained at least one biotech trait; the figure is 60% worldwide.

No change is expected in US policy for biotech crops. Indeed, the US Secretary of State is actively working for adoption of green gene technology in the European Union and elsewhere.

Progress is being made. The European Commission has approved four biotech soybean varieties for import and processing; four more approvals are pending. And, with record food prices in 58 countries experiencing economic recession, consumer surveys indicate a greater willingness to try biotech products that have higher perceived quality, especially if the price is favorable in comparison to organic or conventional products.

In summary, the Genomics symposium at AOCS presented a positive outlook for the US soybean industry, largely due to superior technology. Advances in soybean genomic and biotechnologies will help the United States lead global efforts to ensure an adequate supply of soybeans, provide producers and customers with cost-effective ways to adapt to relevant governmental rules and regulations, and help sustain robust domestic livestock and aquaculture markets for soybeans and soybean products. In addition, it appears that global perceptions of biotechnology are changing because health-conscious consumers want the highest quality foods for the best value. Consumer-driven markets will help ensure that the United States will remain the preferred global supplier of high-quality soybeans.

Richard F. Wilson, Oilseeds & Bioscience Consulting (Raleigh, North Carolina, USA), can be reached at rfwilson@mindspring.com.

2009–2010 AOCS Approved Chemists

A & A Laboratories, Inc.
1000 Backus
Springdale, AR 72764 USA
+1-479-756-1270
John Dillard and Gordon Whitbeck: Tallow and Grease (MIU only), Oilseed Meal, Unground Soybean Meal, Aflatoxin in Corn Meal (test kit)

Abed Laboratories-Division of Anresco Inc.
1370 Van Dyke Avenue
San Francisco, CA 94124 USA
+1-415-822-1100
Aileen F. Borbon: NIOP Fats and Oils, Cottonseed Oil

ADM, Agri Industries, Co.
4805 62nd Ave
Lloydminister, AB T9V 3E7 Canada
+1-780-871-8206
Cass Morrison: Gas Chromatography

Admiral Testing Services, Inc.
12111 River Rd.
New Orleans, LA 70070 USA
+1-985-785-8302
Ray M. Ramos: Oilseed Meal, Unground Soybean Meal, Soybean, NIOP Fats and Oils, Aflatoxin in Corn Meal (test kit)

Advance Mycotoxin Lab
16070 Wildwood Rd.
Wasco, CA 93280 USA
+1-661-758-7790
Dona Stanfield: Aflatoxin in Peanut Paste

A&L Plains Agricultural Labs, Inc.
302 34th St.
Lubbock, TX 79404 USA
+1-806-763-4278
Janet Duran: Oilseed Meal, Cottonseed, Aflatoxin in Corn Meal (test kit)

Algood Food Company
7401 Trade Port Drive
Louisville, KY 40258 USA
+1-502-637-3631
Louisville Analytical Team: Aflatoxin in Peanut Paste (test kit)

ATC Scientific
312 N. Hemlock St.
North Little Rock, AR 72114 USA
+1-501-771-4255
Michael White, Brian Eskridge: Oilseed Meal, Unground Soybean Meal, Soybean Oil, Aflatoxin in Corn Meal (test kit)

Barrow-Agee Laboratories, Inc.
1555 Three Place
Memphis, TN 38116 USA
+1-901-332-1590
Lynn Hawkins, Michael Hawkins: Oilseed Meal, Soybean Oil

Bayer CropScience, Inc.
Site 600
PO Box 117 RR #6
Saskatoon, SK S7K 3J9 Canada
+1-306-477-9443
Rudy Fulawka: Gas Chromatography

Blue Diamond Growers
1802 C Street
Sacramento, CA 95811 USA
+1-916-329-3396
Donna Dean-Zavala: Aflatoxin in Peanut Paste

Bunge Oils
725 N. Kinzie
Bradley, IL 60915 USA
+1-815-523-8148
Bunge Analytical Team: Gas Chromatography, *trans* Fatty Acid Content, Solid Fat by NMR, Edible Fat

Bunge Canada
515 Victoria Ave, North
Hamilton, ON L8N 3K7 Canada
+1-905-577-8056
Zvonko Zubrinic: Edible Fat, Gas Chromatography, *trans* Fatty Acid Content

Canadian Food Inspection Agency
960 Carling Ave, CEF Building #22
Ottawa, ON K1A 0C6 Canada
+1-613-759-1263
Fats and Oils Lab: Gas Chromatography

Canadian Grain Commission, GRL
1404-303 Main St.
Winnipeg, MB R3C 3G8 Canada
+1-204-983-3742
H.K. Howard: Mixed Seed, Soybean
Barry Misener: Gas Chromatography

Can Test, Ltd.
4606 Canada Way
Burnaby, BC V5G 1K5 Canada
+1-604-639-2623
Nilmini Wijewickreme: Cholesterol

Carolina Analytical Services, LLC
17570 N.C. Hwy 902
Bear Creek, NC 27207 USA
+1-919-837-2021
H. Newton Beavers: Oilseed Meal

Certispec Services, Inc.
2813 Murray St.
Port Moody, BC V3X 2C7 Canada
+1-604-469-9180
Cipriano Cruz: Tallow and Grease

Chemiservice Sas
Via V. Ospedale SP 11
Monopoli (Bari) 70043 Italy
+39-080-742-777
Giorgio Cardone: Olive Oil Parts A, B, and C

Compania Numar S.A.
Barrio Cuba
Frente Clinica Moreno Canas, San Jose, Costa Rica
+506-2284-1192
Ricardo Arevalo: Trace Metals in Oil, *trans* Fatty Acids by GC, Solid Fat Content by NMR, Gas Chromatography, Palm Oil

Conagra
1315 Williams Ave.
Memphis, TN 38104 USA
+1-901-729-5638
Jesse Peoples: Gas Chromatography, Soybean Oil, Cottonseed Oil, Vegetable Oil (color only), *trans* Fatty Acid Content, Solid Fat by NMR

Cotecna Inspections, USA
8285 El Rio
Suite 190
Houston, TX 77054 USA
+1-713-440-0900
Zana Gilliam: Tallow and Grease, Gas Chromatography, NIOP Fats and Oils

Cotecna Inspections, USA
1286 Channel Ave.
Memphis, TN 38113 USA
+1-901-942-5229
Sandra Holloway: Oilseed Meal, Soybean, Gas Chromatography, Fish Meal, Soybean Oil, NIOP Fats and Oils, Aflatoxin Corn Meal Test Kit

Covance Laboratories
306 Molly Lane
Cottage Grove, WI 53777 USA
+1-608-241-4471
Daniel Hengst: Aflatoxin Cottonseed Meal

Crystal Laboratory
242 Highway 60 E Suite 2
Lake Crystal, MN 56055 USA
+1-507-726-2387
Steve Marsh: Gas Chromatography

Denele Laboratories, Inc.
1232 South Ave.
Turlock, CA 95380 USA
+1-209-634-9055
Joe Mullinax: Olive Oil (Part A)

Department of Primary Industries
PMB Pine Gully Rd.
Wagga Wagga, NSW 2650 Australia
+81-02-6931821
Dr. Rod Mailer: Gas Chromatography, *trans* Fatty Acid Content

Dr. A. Verwey, BV Handels Laboratory
Roder y weg 30
Oosterhout 4906 CX Netherlands
+31-162-42-1134
Laboratory 2: Aflatoxin in Peanut Paste

Dr. A. Verwey, BV Handels Laboratorium
Coolhaven 32
Rotterdam 3024AL Netherlands
+31-104-76-1055
Laboratory 1: Tallow and Grease, Mixed Seed, Gas Chromatography, NIOP Fats and Oils, Aflatoxin in Peanut Paste

Eurofins Central Analytical Laboratory, Inc
2315 N. Causeway Blvd., Suite 150
Metairie, LA 70001 USA
+1-504-297-3420
John Reuther: Oilseed Meal, Soybean, Trace Metals in Oil, Marine Oil, Marine Oil Fatty Acid Profile, NIOP Fats and Oils, Aflatoxin in Corn Meal (test kit), Nutritional Labeling, Fumonisin in Corn, AOCS/GOED Omega-3 Nutraceutical Oils, Soybean Oil, Palm Oil

Eurofins Central Analytical Laboratory, Inc.
1412 N. Williamsburg County Hwy.
Kingstree, SC 29556 USA
+1-843-201-4365
Marvin Boyd, Jr.: Trace Metals in Oil, Marine Oil, Marine Oil Fatty Acid Profile

Eurofins Scientific
3507 Delaware Ave.
Des Moines, IA 50313 USA
+1-515-265-1461
Ardin Backous, Kent Karsjens: Edible Fat, Tallow and Grease, Oilseed Meal, Unground Soybean Meal, Soybean, Cholesterol, Fish Meal, Soybean Oil, Vegetable Oil for Color Only, Aflatoxin in Corn Meal (test kit), Nutritional Labeling
Anders Thomsen: AOCS/GOED Omega 3 Nutraceutical Oils

Fieldale Farms Corp.
PO Box 558
Baldwin, GA 30511 USA
+1-706-778-5100
Janet Smith: Oilseed Meal, Aflatoxin in Corn Meal (test kit)

Fuji Vegetable Oil, Inc.
120 Brampton Rd.
Savannah, GA 31408 USA
+1-912-966-5900
Greg Newman: *trans* Fatty Acid Content, Edible Fat

Golden Foods/Golden Brands
2520 7th St.
Louisville, KY 40208 USA
+1-502-636-1321
James Houghton: Edible Fat

XGolden Peanut Company
304 W. Washington Ave.
Ashburn, GA 31714 USA
+1-229-567-3311
Tamalynn Gipson: Aflatoxin in Peanut Paste (test kit)

Hahn Laboratories, Inc.
1111 Flora St.
Columbia, SC 29201 USA
+1-803-799-1614
Frank Hahn: Oilseed Meal, Unground Soybean Meal, Cottonseed, Soybean Oil, Aflatoxin in Corn Meal (test kit)

Health Canada
2301 Midland Ave.
Scarborough, ON M1P 4R7 Canada
+1-416-973-1567
William Lillycrop: *trans* Fatty Acid Content

Illinois Crop Improvement Association
3105 Research Road
Champaign, IL 61826 USA
+1-217-359-4053
Sandra K. Harrison: Oilseed Meal

INOLASA
Barranca Puntarenas, Contiguo a la Zona Franca
Puntarenas 6651-1000 San Jose, Costa Rica
+506-663-0323
Jesus Gomez Salgado: Edible Fat, Unground Soybean Meal, *trans* Fatty Acid Content

Inspectorate America Corporation/Agri-Division
1308 Holland Ave.
Galena Park, TX 77547 USA
+1-713-451-2121
Ramesh Patel, Mumtaz Haider: Tallow and Grease, Oilseed Meal, Soybean, NIOP Fats and Oils, Aflatoxin in Corn Meal (test kit)

International Analytical Services S.A.S
Av la Marina 3035, San Miguel
Lima 32 Peru
+511-6165221
Carmen Catter de Bueno: Fish Meal

Intertek Agri Services
160 East James Dr. Suite 200
St. Rose, LA 70087 USA
+1-504-602-2138
Harvey P. Becnel: Tallow and Grease, Oilseed Meal, Mixed Seed, Soybean, Gas Chromatography, Soybean Oil, Cottonseed Oil, Olive Oil Parts A, B, and C, NIOP Fats and Oils, Aflatoxin in Corn Meal (test kit)

Isotek, L.L.C.
4901 W. Reno
Suite 200
Oklahoma City, OK 73127 USA
+1-405-948-8880
Ed Corey, Bruce Kerr: Tallow and Grease, Oilseed Meal

Jacob Stern & Son
2104 75th St.
Houston, TX 77011 USA
+1-713-926-8386
Robert Poullard, Jr.: Tallow and Grease

Jeil Feed Co, Ltd
40-36 Daewha-dong
Daedeok-ku
Taejon 306-802 South Korea
+82-42-624-4101
Jae-Ku Lee: Unground Soybean Meal

JLA
145 Peanut Dr.
Edenton, NC 27932 USA
+1-252-482-4456
Edenton Analytical Team: Peanut, Aflatoxin in Peanut Butter, Aflatoxin in Peanut Paste, Aflatoxin in Peanut Paste (test kit),

Gas Chromatography, Aflatoxin in Corn Meal (test kit)

JLA
1200 Wyandotte Dr.
Albany, GA 31705 USA
+1-229-889-8293
Albany Analytical Team: Peanut, Aflatoxin in Peanut Paste, Aflatoxin in Peanut Paste (test kit), Aflatoxin in Peanut Butter, Gas Chromatography

JLA
139 South Lee St.
Ashburn, GA 31714 USA
+1-229-567-3703
Ashburn Analytical Team: Aflatoxin in Peanut Paste (test kit)

JLA
616 W. Navarro St.
DeLeon, TX 76444 USA
+1-254-893-3653
DeLeon Analytical Team: Aflatoxin in Peanut Paste, Aflatoxin in Peanut Paste (test kit), Aflatoxin in Corn Meal (test kit)

JLA
284 N. Main
Blakely, GA 39823 USA
+1-229-723-9155
Blakely Analytical Team: Aflatoxin in Peanut Paste, Aflatoxin in Peanut Paste (test kit)

JLA
107 E. Railroad St.
Headland, AL 36345
USA
+1 334-693-9320
Headland Analytical Team: Aflatoxin in Peanut Paste (test kit)

JLA
208 W. Main St.
Brownfield, TX 79316 USA
+1-806-637-9598
Brownfield Analytical Team: Aflatoxin in Peanut Paste, Aflatoxin in Peanut Paste (test kit), Peanut

JLA China
Room 101
306 Ning Xia Rd
Qingdao, Shangdong 266071 China
+86-532-8210-7126
Analytical Team: Aflatoxin in Peanut Paste

K-Testing Laboratory
1555 Three Place, Suite A
Memphis, TN 38116 USA
+1-901-525-0519
Edgar Tenent, Frank Tenent: Oilseed Meal

Malaysian Palm Oil Board (AOTD)
Lot 9 & 11
Jalan P10/14
Bandar Baru Bangi, Selangor 43650 Malaysia
+603-89255708
Dr. Hazimah Abu Hassan: Gas Chromatography, *trans* Fatty Acid Content

Minnesota Valley Testing Lab
1126 North Front St.
New Ulm, MN 56073 USA
+1-507-233-7171
Joel Sieh: Oilseed Meal

Modern Olives Laboratory Services
PO Box 92
Lara VOC 3212 Australia
+1-61-352729570
Claudia Guillaume: Olive Oil (Parts A, B, and C)

National Beef Packing Company
1501 E. 8th St.
Liberal, KS 67901 USA
+1-620-626-0646
Adalberto Coronado, Jose Garcia: Tallow and Grease

New Jersey Feed Lab, Inc.
1686 Fifth St.
Trenton, NJ 08638 USA
+1-609-882-6800
Pete Cartwright: Oilseed Meal, Gas Chromatography, Marine Oil Fatty Acid Profile, AOCS/GOED Omega-3 Nutraceutical Oils
Carl W. Schulze: Fish Meal

Northland Laboratories
1818 Skokie Blvd.
Northbrook, IL 60062 USA
+1-847-272-8700
Leonardo Cui: Cholesterol

Nutco Inc.
30 Citizen Court
Markham, ON L6G 1C4 Canada
+1-905-946-8281
Ada Wong Ferenci, Candice Calbert: Aflatoxin in Peanut Butter

OmegaPure
6961 Brookhollow West Dr., Suite 190
Houston, TX 77040 USA
+1-713-940-6224
Hema Marwaha: Marine Oil, AOCS/GOED Omega-3 Nutraceutical Oils

PT Asianagro Agungjaya
Jalan Semarang Blok
Marunda
Jakarta Utar KBN 14150 Indonesia
+62-21-4402591
Ivenny Pangestu: Palm Oil

Quality Services and Soltions (QSS)
Plot No 32, Section 9
Nr Central Bank of India
Gandkidham 370 201 India
+91-2836-236372
Uday Padhye: Palm Oil

Sanimax-ACI, Inc.
2001 Ave De La Rotonde
Quebec, QC G6L 2L9 Canada
+1-418-832-4645
Jean-Francois Harvey: Tallow and Grease

Sanimax-San
9900 6th St.
Montreal, QC H1C 1G2 Canada
+1-514-648-6001
Andre Roberge: Tallow and Grease

Schwan Research and Development
3123 Centennial Rd.
Salina, KS 67401 USA
+1-785-825-1671
Darren Schultz: *trans* Fatty Acid Content

SDK Laboratories
1000 Corey Rd.
Hutchinson, KS 67501 USA
+1-620-665-5661
Dennis Hogan: Oilseed Meal, Aflatoxin in Corn (test kit)

Ser-Agro S.A.
Kilometro 139 Carretera a Corinto
Chinandega CHI Nicaragua
+505-340-3493
Norma Hernandez: Peanut

Servi-Tech
1816 E. Wyatt Earp Blvd.
Dodge City, KS 67801 USA
+1-620-227-7123
Duane O. Winter: Tallow & Grease, Oilseed Meal

SGS North America
151 James Dr. West
St. Rose, LA 70087 USA
+1-504-463-6401
William Spence: Gas Chromatography, *trans* Fatty Acid Content, Oilseed Meal, Unground Soybean Meal, Olive Oil Part A, B, and C, Aflatoxin Corn Meal (test kit)

SGS (Thailand) Ltd.
41/23 Rama 3 Rd., Soi 59
Chongnonsee, Yanawa
Bangkok, 10120 Thailand
+66-2-294-7485
Vira Suphanit: Fish Meal, Oilseed Meal, Nutritional Labeling

Silliker Canada Co.
90 Gough Rd.
Markham, ON L3R 5V5 Canada
+1-905-479-5255
Jocelyn Alfieri: Cholesterol, Gas Chromatography, Aflatoxin Peanut Paste (test kit), Marine Oil Fatty Acid Profile, Nutritional Labeling, *trans* Fatty Acid Content

Solae Company
413 Cressey Avenue
Remington, IN 47977 USA
+1-219-261-2124
Ronald L. Robinson: Unground Soybean Meal

Southern Acids (M) Bhd.
Golconda Estate, 10th Mile
Jalan Kapar Kapar
Klang, Selangor 42200 Malaysia
+603-32508723
Tan Pei Fong: Gas Chromatography

Sovena Oilseeds Laboratory
Palenca de Baixo, Apartado 24
Almada 2801-801 Portugal
+351-21-294-9000
Sovena Oilseeds Laboratory: Unground Soybean Meal, Soybean, Gas Chromatography

Stratus Foods–Technology Center
7970 Stage Hills Blvd.
Bartlett, TN 38133 USA
+1-901-387-2237
Eddie L. Baldwin: Gas Chromatography, *trans* Fatty Acid Content, Solid Fat by NMR, Edible Fat

Testing Services (Sabah) Sdn Bhd
1st Floor, Lot 1
Blk N, Bandar Ramai 2
Sandakan, Sabah 90712 Malaysia
+60-89-210431
Kong Khim Chong: Palm Oil

Thai Vegetable Oil
149 Ratchadapisek Rd. (Thapra-Taksin)
Bukkhalow Thonburi
Bangkok, 10600 Thailand
+662-4779020
Benya Boriboonwiggai: Unground Soybean Meal

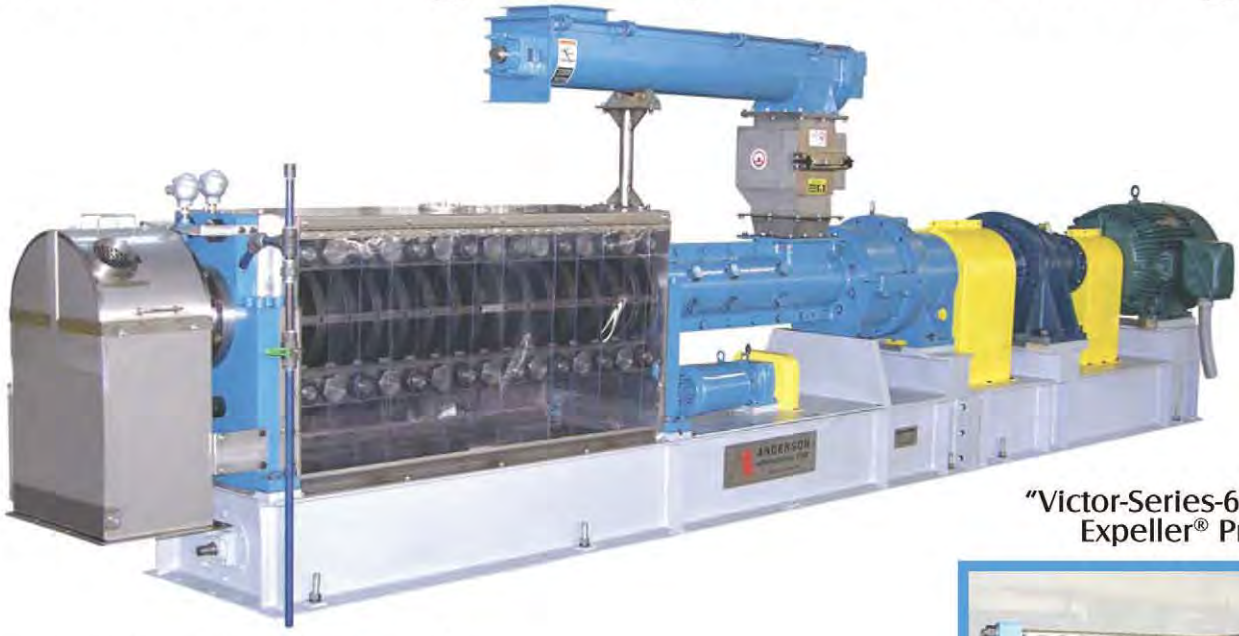
Thionville Laboratories, Inc.
5440 Pepsi St.
Harahan, LA 70123 USA
+1-504-733-9603
Paul C. Thionville, Shani Jolly, Andre Thionville, Boyce Butler: Tallow and Grease, Oilseed Meal, Mixed Seed, Soybean, Gas Chromatography, Palm Oil, Trace Metals in Oil, Fish Meal, Marine Oil, Marine Oil FAP, *trans* Fatty Acid Content

Trilogy Analytical Laboratory
870 Vossbink Dr.
Washington, MO 63090 USA
+1 636-239-1521
Ryan Malone: Aflatoxin Corn Meal

University of Missouri- Columbia
Analytical Services
Room 4 Agriculture Building
Columbia, MO 65201 USA
+1-573-882-2608
Thomas P. Mawhinney: Cholesterol, *trans* Fatty Acid Content, Oilseed Meal ■

ANDERSON DURABILITY

"Anderson is Pleased to Unveil it's Most Innovative Design in Expeller® Technology"



"Victor-Series-600™ Expeller® Press"

Anderson is Proud to Introduce the "Victor-Series" Expeller® Press

Not since the invention of the Expeller® by Anderson in 1900 have so many new and beneficial features been designed into this innovative processing machine for the oilseed industry.

Please contact us and we will discuss and show you the new innovations that make this the most efficient, productive, durable and maintenance free Expeller® press, such as:

- VFD driven main shaft for optimum capacity and residual oil performance
- Expander design feed section which eliminates force feeding and increases rapid oil release
- Innovative discharge choke reduces load on thrust bearing, thus increasing wear life on bearings, seals and sleeve. The choke design is maintained without disassembly of any other press assemblies.

ANDERSON INTERNATIONAL CORP®

6200 Harvard Avenue, Cleveland, Ohio 44105 U.S.A.
Phone: (216) 641-1112 · Fax: (216) 641-0709
Website: http://www.andersonintl.net

Your "Eye" for Food & Biofuel Testing

Peroxide Value

Free Fatty Acids

Percent Fat

Glycerin

"Touch Screen Easy"

Introducing the NEW SafTest II high sensitivity platform for food and biodiesel testing. The combination of touch screen based protocols with ready-to-use kits make your most demanding applications quick, simple and accurate. With R coefficient > 0.98, nanomolar sensitivity and low C.V. values, this AOAC Certified System and Kits are the most economical solution for accurate determination of Peroxide Value, Free Fatty Acids / Acid Number, Glycerin, Percent Fat and other analytes in your production, quality assurance and R&D environment.

www.mpbio.com/saftest

MP Biomedicals, LLC • North America, Tel: 1.800.848.1163 • Europe, Tel: 00.33.3.88.67.54.44 • saftest@mpbio.com

MP™